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MANAGEMENT ACCOUNTING: Text and Cases

MANAGEMENT ACCOUNTING

Text and Cases

MANAGEMENT ACCOUNTING

Text and Cases

By ROBERT N. ANTHONY, D.C.S.
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PREFACE

Two groups of people in a business firm need to know something about accounting. One group consists of those who collect, report, and interpret accounting information; the other consists of those who use this information. The first group can be designated "accountants," and the second group, "management," although these labels are not precise, for many accountants use the information they collect, and accounting information is also used by persons who are by no means members of the management group.

This book is intended for the users of accounting information. The emphasis, therefore, is not on accounting techniques, but rather on the way in which accounting information can be used in the management process. Procedures and techniques are not ignored, however, for some knowledge about them is essential to an understanding of the figures that flow from accounting systems.

As is the case with most subjects, the process of learning about management accounting involves two kinds of mental activity: (1) the acquisition of knowledge and (2) an increase in skill and understanding. These correspond to the two kinds of material that make up this book: (1) text and (2) cases.

In a favorable educational environment, some knowledge can be conveyed by the written word. The text material is designed to facilitate this part of the learning process. Unlike the material in a textbook, the text material in this book does not attempt to give a full, rounded discussion of the topics considered. Rather, the text is intended to describe tools that are useful in analyzing and solving the problems presented in the cases. Moreover, some topics that are described in the cases themselves are omitted or mentioned only briefly in the text material. Thus, although the text material is intended to convey knowledge, some knowledge is also conveyed through the cases.

It should be emphasized that the cases have been selected because of their interest and educational value as a basis for class discussion. They are not necessarily intended to illustrate either correct or incorrect handling of management problems. Skill in the management use of accounting information can be acquired, I believe, only through experience. Thinking about a case, and discussing it in the classroom and in informal discussion groups, can help to provide such experience. In preparing to discuss a case in class, the student is required to *do* something —to analyze a problem, to weigh various factors involved in it, to make some calculations, to take a position, and so on. In class, the student is required to explain his point of view, to defend it, to understand and appraise the arguments of his colleagues, and to decide what arguments are the strongest. Practice in doing these things helps to increase skill and understanding; in fact, many educators believe that the really important parts of a subject can be learned only by experience of some sort, as opposed to merely hearing or reading about them. Thus, although the case material comprises less than half the pages in this book, the discussion of these cases is by far the more important part of the educational process.

On the other hand, a case cannot be a complete substitute for experience in a real business situation. The written words in a case do not reproduce exactly or completely the background of the situation that the case describes. In particular, the emotions, prejudices, abilities, and interrelationships of the people involved in the case situation are bound to be inadequately reported. Nevertheless, the cases can help to give some appreciation of the ways in which accounting information can be used and the problems involved in using it.

Many of the cases and much of the text material have been used by a variety of groups over the past ten years. They range in educational background from high school graduates through CPA's, in age from 16 to 65, and in experience from none to top executives participating in executive development programs. Groups of widely different compositions seem to find the cases interesting and the educational experience valuable, even though their approach to the cases differs greatly, depending on their age, education and experience, and on the classroom environment.

Acknowledgments

First, we express again our gratitude to the businessmen who were willing to give their time and the benefit of their experience in the development of the cases.

The material in this book is an outgrowth of experience in teaching the course called "Control" in the Harvard Business School (although the coverage of that course is much broader than the coverage of this book). I owe a special debt therefore to the two men who were largely responsible for creating and developing this course, Professors Ross G

Walker and Charles A. Bliss. My colleagues in teaching this course since its inception in 1946, who contributed both generally to the development of the material and specifically to the writing or revision of both text and cases, include: Earl Bennett, Thornton F. Bradshaw, James W. Culliton, Robert Wm. Haigh, Arthur W. Hanson, Neil E. Harlan, James K. Hart, Russell H. Hassler, George Kozmetsky, Tom Lilley, Clarence B. Nickerson, Hrand Saxenian, Robert O. Schlaifer, Leo A. Schmidt, and Lawrence E. Thompson.

In addition to the persons named above, case material was written by the following members of the research staff of the School: John Baitsell, Jerry Brougher, Charles Christenson, Ralph D. Cies, E. K. Cratsley, Charles Ellington, John Fayerweather, Robert Fowler, J. W. Horwitz, Katherine LaBrunerie, Peter Laubach, J. B. Lackey, Louis Marengo, Jacqueline Scarborough, R. S. Swain, Donald Thain, Richard Vancil, and Robert Lavoie.

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Many of the ideas in Chapters 14 and 16 stem from a series of weekend discussion meetings over the past three years held by the Committee on Cost Concepts of the American Accounting Association, and parts of these chapters correspond closely to the report of that committee. My colleagues on the committee, who in a real sense contributed to these chapters, include Professors Norton M. Bedford, our Chairman, B. C. Lemke, James Schindler, Edward L. Wallace, and Glenn Welsch.

Professors at other schools who have used this material have been most generous with their comments and suggestions. Among these, my special appreciation goes to Professor James Taylor of the University of Western Ontario and Professor Almand Coleman of the University of Virginia. Professor Paul Kircher of the University of California at Los Angeles also made helpful, practical suggestions on both the case material and the text. I owe a great debt to Professor Willard Graham of the University of North Carolina, editor of the Irwin Series on Accounting, who has made extremely helpful suggestions on the text material, based on his lifetime of experience in teaching the subject.

Finally, I wish to acknowledge the considerable, but of course quite different, contribution made by two fine women: my wife, Gretchen, who has both encouraged me and has shielded me from the normal distractions of a busy home during the period in which this book was being written; and my secretary, Miss Helen Vinal, who has labored over the material, in one form or another, for the better part of three years.

ROBERT N. ANTHONY

BOSTON, MASSACHUSETTS
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Chapter 1

MANAGEMENT'S USE OF ACCOUNTING INFORMATION

Nearly every business enterprise has an accounting system, that is, a means of collecting, summarizing, analyzing, and reporting, in monetary terms, information about the business. The accounting systems in most businesses were designed for the primary purpose of providing financial information to persons outside the business—stockholders, banks, other creditors, and government agencies. The techniques, rules, and conventions according to which accounting figures are collected and reported, therefore, reflect, to a considerable extent, the requirements of these outside parties.

The persons responsible for operating a business—that is, the management—also need monetary information to aid them in doing their job effectively. Although some of this information can be obtained from reports prepared for outsiders, management also requires a great deal of information not contained in these external reports. *Management accounting,* as used here, is concerned with accounting information that is useful to management.

"Use" always connotes some *purpose* for which the figures are to be used. As we shall see, the character of the information that is collected varies greatly according to the purpose for which the information is to be used. The problems we shall discuss are not like textbook problems in mathematics, in which figures are often manipulated with no practical objective in mind. We are concerned with accounting figures only to the extent that they contribute to the recognition or solution of a management problem.

Plan of the Book

In order to use accounting information properly, one must understand what the figures mean; and in order to do this, one must know something about the important concepts, rules, and techniques of conventional accounting. These matters are discussed in Part I.

The approach to conventional accounting used here is something like that used by an airplane pilot in learning to use his instruments. The pilot needs to know the meaning of the message conveyed by each of his instruments; that is, he needs to know such things as the fact that a clockwise movement of a certain arrow probably means one thing and that a counterclockwise movement probably means another thing, that the flashing of a red light probably means that a certain part is not functioning, that a certain sound in his earphones probably means that he is on course, and so on. The word "probably" is used because, for one reason or another, an instrument may not always give the reading that it is supposed to give; the pilot must realize this, and he must also understand something of the likelihood of, and the reasons for, these abnormalities. On the other hand, the pilot does not need to know how to design airplane instruments, how to construct them, how to check them for accuracy, how to maintain them, or how to repair them. Specialists are available for these important functions.

Similarly a person who is to make intelligent use of accounting information must understand what a given accounting figure probably means, what its limitations are, and under what circumstances it may mean something different from the apparent "signal" that it gives. He does not, however, need to know how to design, construct, operate, or check on the accuracy of an accounting system. He can rely on accountants for these important functions. The discussion of accounting in Part I is limited, then, to matters which it is believed that the *user* of accounting information needs to know.

Knowledge of the meaning of an instrument reading is by no means all, or even a very important part of, what the pilot needs to know in order to fly his plane. In addition, he must know how to use this knowledge to solve the problems that arise during flight, and he must know a great deal about the "art" of flying, which includes many matters that have little or nothing to do with the instruments. Part II of this book deals with the use of accounting information. As is the case with the pilot, there is much more to the "art" of management than the use of accounting information, and this is in no sense a book on the whole art of management.

PURPOSES FOR WHICH ACCOUNTING INFORMATION IS USED

As noted above, most accounting systems are designed to report information about the business to outsiders; that is, to persons who, either because they have provided money or for other reasons, have an interest in what is going on in the business, but who are not directly involved in its day-to-day management. The two principal reports, or financial statements, used to convey accounting information to these outside parties are the balance sheet and the income statement. Since financial statements are also valuable to management as a general indication of the over-all status and progress of the enterprise, our examination of accounting will begin with a study of them—how these reports are constructed, and how they may be used by management. Chapters 11, 12, and 13 discuss the use of financial statements by management.

In addition to providing a report on what is happening in the business, accounting information may be helpful for a number of other purposes. It is convenient to group these purposes under two main headings: (1) planning and (2) control.

Planning

Planning is the process of deciding what action should be taken in the future. Usually the planning process consists of considering several alternative courses of action and deciding which of these is best. The area covered by one plan may be a tiny segment of the enterprise, or it may be the whole enterprise. Thus, a decision as to whether the price of one product should be increased 10 cents or allowed to remain unchanged is a plan, and so is a decision to merge or not to merge the company with another company.

The essential characteristic of a plan is that it involves a decision about action to be taken in the future. Planning is therefore to be distinguished from *forecasting.* A forecast is an estimate of what will happen in the future, but the forecaster makes no attempt to influence the future by his own decisions or action. People *forecast* the weather, but they do not—except in the few areas where cloud-seeding operations are carried on—attempt to *plan* the weather.

Some businesses have planning staffs whose full-time job is to assist in making plans. The planning function, however, is much broader than the work done by these staffs; it is performed at all levels in the organization and in all organizations, whether or not they have separate planning staffs. The foreman who decides to route a certain job through Machine A rather than through Machine B is planning, on a smaller scale but in the same sense, as is the president who decides on a ten-year expansion program.

As a means of systematically studying the use of accounting information in the planning process, it is useful to consider separately two types of planning: (*a*) period planning and (*b*) project planning. In practical situations, these two types merge into one another, and there is often no conscious attempt to distinguish between them. Period planning is discussed in Chapter 16, and project planning in Chapters 17 and 18.

Period planning, or *budgeting,* is the process of planning the over-all activity of the enterprise for a specified period of time, usually a year. An important objective of this process is to fit together the separate plans made for various segments of the enterprise to assure that these plans harmonize with one another and that the aggregate effect of all of them on the whole enterprise is satisfactory. For example, the budgeting process might reveal that the sales organization has planned a considerable increase in the sales of one product line but that the production organization has not planned for the additional facilities and manpower necessary to turn out the increased volume; or an expansion of facilities might be planned without adequate consideration of where the funds required to build these facilities are to be obtained. In a very small business, top management may have a sufficient personal awareness of over-all plans so that formal, written budgets are unnecessary, but a business of any considerable size is likely to be so complex that some systematic process of formulating and balancing the plans for the separate parts of the enterprise is essential.

Project planning involves a specific decision concerning one segment of the business. This might be a decision to buy a new machine, to attempt to enter a new market, to use a new type of raw material or a new method of manufacturing, to borrow money from a bank, or any of a host of others. Unlike period planning, which usually is done according to a set time schedule each year, project planning takes place whenever an opportunity or need presents itself. As will be seen, the type of accounting information used in project planning is often of quite a different character from the type used in period planning.

Control

Control is the process by which management assures itself, insofar as is feasible, that what the organization does conforms to management's plans and policies. Accounting information is useful in the control process in the following ways:

a) *As a Means of Communication.* The budget process, mentioned above, is not only a device for planning but also is a means of informing the organization of the plans that have been approved by management and, therefore, of the actions that management wishes the organization to take during the budget period.

b) *As a Means of Motivation.* Unless the business is a one-man enterprise, management's job is not to do the work—i.e., to make and sell the product—but rather to see to it that the work gets done by others. This requires, first, that personnel be hired and formed into an organization and, secondly, that this organization be motivated in such a way that it will do what management wants it to do. Accounting information can help (and also, unless properly used, can hinder) this motivation process.

c) As a Means of Checking Up. Periodically, management needs to evaluate how well the employees are doing their jobs. Such an appraisal of performance results in salary increases, promotion, reassignment, corrective action of various kinds, or, in extreme cases, dismissal. Accounting information can assist in this appraisal process, although an adequate basis for judging a man's performance cannot be obtained solely from information revealed by accounting records.

In addition to the functions of planning and control, it is useful, for some purposes, to think of a third function called *operations.* In terms of such a classification, the three functions could be viewed as: (1) planning what you intend to do; (2) operating, or getting it done; and (3) checking up on how well it was done. The "operating" area would include such techniques as production control, scheduling, quality control, and inventory control. These techniques are too specialized to be included in this book; therefore, the use of accounting information as a direct aid in day-to-day operations is not here treated as a separate major topic. Instead, matters that are relevant to this area are discussed at appropriate places in chapters dealing with the other two topics.

SOME GENERAL CONSIDERATIONS

Before we plunge into detail, it may be well to consider briefly a few general matters that apply to all sorts of problems and to all types of figures, both accounting and nonaccounting. Although they are introduced here, it is not expected that these points will become entirely meaningful or concrete until the student has had the opportunity of examining and thinking about their relevance in specific case situations. It may therefore be desirable to refer back to these points from time to time.

Different Figures for Different Purposes

In mathematics, and in most of the physical sciences, there are definitions that are valid under a wide variety of circumstances. Such is not the case with most accounting definitions. Each of the purposes described in the preceding section requires a different kind of accounting figure. Since these different figures may superficially resemble one another and may even be called by the same name, a person who is not familiar with them may easily become confused or frustrated. The most common source of confusion is the word "cost." As will be seen in later chapters, there are historical costs, standard costs, variable costs, differential costs, estimated costs, and full costs; each is a different concept, and each is relevant in a certain kind of problem.

Accounting figures should always be discussed in terms of the particular problem that they are intended to help solve, rather than in any abstract sense. A statement that "the cost of such-and-such is $100" literally has no meaning unless those who hear this statement understand clearly which of the several possible concepts of cost was intended. A useful procedure to follow in approaching a specific problem is to define, as carefully as possible, the purpose for which figures are to be used in that problem and then to consider how the figures should be assembled and used for that particular purpose.

Accounting Figures Are Approximations

Accounting is a system for recording measurements of business facts, and, as is the case with any measurement, an accounting figure is an approximation rather than a precisely accurate statement. Most of the data used in the physical sciences are also measurements, and like the scientists and engineers, the user of accounting information must acquire an understanding of the degree of approximation that is present in the data.

Consider, for example, the concept of temperature. With instruments designed for the purpose, temperature of the human body is easily measured to a tenth of a degree, and that of a room to a degree or so, but the temperature of the sun is measured only in very approximate terms. Although these measurements differ widely in their degree of accuracy, each is useful for a particular purpose. Similarly, some accounting figures, such as the amount of cash on hand, may be accurate within very narrow limits, while others are only rough approximations.

There are many reasons for the roughness of accounting figures. A few are mentioned here, and others will become apparent in later chapters. One of them is simply that a business is a complicated organism which includes vastly dissimilar elements—money, buildings, morale, machines, incentives, materials, policies, and so on. There can be no precise way of adding all these diverse elements together so as to form a picture of the whole enterprise.

The problem of obtaining reasonably accurate measurements is further complicated by management's desire to obtain information quickly. A rough approximation that is available today is often more useful to management than a more accurate figure published a year from now. For instance, consider the cost of owning and operating an automobile. This cost includes the purchase price of the automobile, plus the cost of gasoline, repairs, and other operating items, less anything that is received when the automobile is sold or traded. Thus, the true cost cannot be known until the automobile is sold or traded, but businessmen are unwilling to wait this long before learning anything about automobile costs; they want information on how much the automobile cost last month or last year. In order to provide this information, the accountant must work with estimates of how many years or months the automobile will be used in the future and how much will be received when it is eventually sold or traded. The accuracy of any figure showing the costs of the automobile depends on the validity of these estimates.

For the same reason that automobile costs cannot be determined accurately until the automobile is sold, so the profit of a whole company, which depends on the measurement of a wide variety of costs, cannot be determined accurately until the company goes out of business. Also, for reasons to be discussed subsequently, the profit of a division, a product, or other segment of a company usually cannot be measured with close accuracy. Nevertheless, management needs information on costs and profits for short periods of time, such as a month, and for individual divisions, products, or other segments of a business. Accounting will furnish such information, and it can be most helpful to management. (After all, one needs only a rough approximation of the outside temperature in order to decide whether to wear an overcoat.) Management must clearly understand, however, the approximations that are inherent in most accounting figures.

The degree of approximation is especially high in the case of the figures used for planning purposes. Such figures are always estimates of what will happen in the future. Businessmen are not clairvoyant, however; they do not *know* what will happen in the future, and the figures used for planning purposes can be no better than estimates of what the future holds.

Working with Incomplete Data

No one could ask you to solve a problem in mathematics without furnishing you all the information you need. In a business problem, on the other hand, one almost never has exactly the information he would like to have. In nearly every case described in this book, you can think of additional information that would be helpful if it were available. This is what happens also in practical business situations. On the other hand, there are many business situations in which page after page of figures are available, but only a small fraction of them are at all relevant to the problem at hand, and perhaps none of them is quite what you need to solve the problem.

It is a fact of life, however, that problems must be solved, business decisions must be made, and often the decision cannot be delayed until all the pertinent information is collected. One does the best he can with what he has, and then moves on to the next problem. On the other hand, a decision should not be made if a vital, obtainable piece of evidence is missing. Deciding whether or not to act on the available evidence is one of the most difficult parts of the whole decision process. As the late Dean Wallace B. Donham has put it: "The art of business is the art of making irrevocable decisions on the basis of inadequate information."

Figure Evidence Is Only Partial Evidence

Few, if any, business problems can be solved solely by the collection and analysis of figures. Usually, there are important factors that cannot be, or have not been, reduced to numbers. For example, think of how you would judge the performance of a baseball player. Every time a baseball player comes to bat, and almost every time he handles the ball in the field, a statistic is generated. Detailed records are published on his times at bat, walks, hits, two-base hits, home runs, strike outs, put outs, fielding chances, assists, errors, earned run average, and so on. Nevertheless, when the manager of the team must decide whether A is a better ball player than B, he knows better than to rely completely on the numerical information. Such factors as how well a man gets along with his colleagues, his ability to hit in the pinches, and other unmeasurable characteristics must also be taken into account. Indeed, if this question could be answered solely by an analysis of statistics, there would be no reason for the millions of man-hours of discussion that are held by the "hot-stove league" during the winter months. An important objective of the cases in this book is to provide a basis for judging the relative importance of figure and nonfigure data in the solution of management problems.

People, Not Figures, Get Things Done

An obvious fact about business organizations is that they consist of human beings. Anything that the business accomplishes is the result of the action of these people. Figures can assist the people in the organization in various ways, but the figures themselves are literally nothing but marks on pieces of paper; by themselves they accomplish nothing. It is surprising how often this point is overlooked.

An accounting system may be beautifully designed and carefully operated, but the system is of no use to management unless it results in action by human beings. For instance, three companies may use exactly the same system—the same chart of accounts, the same set of records and reports, the same procedure for collecting and disseminating information—with entirely different results. In one company, the system may be *useless* because management never acts on the information collected, and the organization has become aware of this fact. In the second company, the system may be *helpful* because management uses the information as a general guide for planning and control and has educated the organization to use it in the same spirit. In the third company, the system may be *worse than useless* because management overemphasizes the importance of the accounting figures and neglects other and more important information.

Summary

In this book we shall discuss some powerful tools that can assist management in the tasks of operating a business. As a matter of fact, the discovery and refinement of these tools has, in a significant way, made possible the creation and efficient operation of large enterprises, and it is scarcely conceivable that any business, except the smallest ones, could operate without them. At the same time we shall explore the limitations on the use of these tools. We shall see that in the real world, formulas or mechanical techniques rarely provide the complete solution to a problem. The essential reason for this limitation has been well summed up by G. K. Chesterton:

> The real trouble with this world of ours is not that it is an unreasonable world, nor even that it is a reasonable one. The commonest kind of trouble is that it is nearly reasonable, but not quite. Life is not an illogicality; yet it is a trap for logicians. It looks just a little more mathematical and regular than it is; its exactitude is obvious, but its inexactitude is hidden; its wildness lies in wait.[1]

CASES

CASE 1–1. CONAN COMPANY

The Conan Company manufactured an inexpensive grade of men's clothing which it sold through house-to-house salesmen. A salesman took the measurements of the customer and entered them on the order blank, which the company used as a cutting order. Since the company found from experience that the measurements were usually of approximately regular sizes, it cut the garments from regular sized patterns with only slight changes. The wool worsted goods used by the Conan Company cost approximately $3.00 per yard.

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[1] *Orthodoxy,* London: The Bodley Head, 1949 reprint, p. 131.

In order to insure very quick delivery the company made out cutting tickets for each garment as fast as orders were received and distributed them to the cutters together with a record of the standard yardage allowance for cutting that size of that style garment. It was expected that cutters would try to cut garments out of the least amount of cloth possible in order to keep down costs. They were, of course, also expected to cut as many garments as possible in a day. Each cutter earned $1.80 per hour and worked eight hours per day.

A careful record was kept of the garments cut each day. A transcript of the cutting record for one day is shown in Exhibit 1.[2] Yardage figures are given to the hundredth of a yard for ease in computation.

Questions

1. What conclusions can you draw from a cross-classification of yardage lost or saved according to cutters and styles? (By cross-classification is meant an orderly arrangement of the figures, grouped in column and row according to cutter, or style, or some other factor.)
2. Should the most careful cutter specialize on the style for which losses are most frequent?
3. Before taking any action, what additional information would be needed?

CASE 1–2. C. R. HAYES, INC.

Mr. F. W. Walker, the personnel manager of C. R. Hayes, Inc., a department store doing a business of approximately $30,000,000 annually, was charged with the responsibility for all matters relating to personnel in the store. He arranged for the hiring and the firing of all the store salespeople and also considered all salary increases and decreases of both selling and nonselling employees.

It was the policy of the store to review a salesperson's record every twelve months on the anniversary of his entrance into the store. On the anniversary date the salesperson's department manager received a form

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[2] The sample used in this case is too small to be adequate. A small sample is used, however, to bring out certain points without requiring the student to spend time on mere mechanical handling of a large number of figures. For purposes of class discussion, you may assume that this record is representative.

Exhibit 1

CUTTING RECORD

Cutting Ticket Number	*Cutter*	*Style*	*Cloth*	*Color*	*Size*	*Yards Saved*	*Yards Lost*
1	A	102	1073	Grey	37	...	0.10
2	B	101	1116	Blue	39	...	0.02
3	C	104	1178	Blue	37	...	0.10
4	D	103	1241	Brown	38	0.04	...
5	A	102	1073	Brown	40	...	0.14
6	B	101	1116	Brown	38	0.04	...
7	C	104	1178	Blue	38	...	0.06
8	A	103	1241	Brown	36	0.08	...
9	D	103	1241	Grey	35	0.10	...
10	B	104	1178	Grey	37	0.06	...
11	C	101	1116	Blue	36	...	0.06
12	A	101	1116	Grey	40	0.02	...
13	B	104	1178	Brown	37	0.00	0.00
14	D	104	1178	Blue	39	0.06	...
15	C	101	1116	Blue	36	...	0.08
16	A	103	1241	Brown	38	0.04	...
17	C	102	1073	Brown	40	...	0.18
18	D	103	1241	Blue	42	0.02	...
19	B	103	1241	Grey	36	...	0.04
20	A	102	1073	Brown	37	...	0.08
21	C	102	1073	Grey	37	...	0.16
22	B	102	1073	Brown	36	...	0.10
23	C	103	1241	Brown	38	0.02	...
24	A	104	1178	Grey	38	0.06	...
25	D	101	1116	Brown	36	0.04	...
26	B	104	1178	Brown	37	0.08	...
27	C	104	1178	Blue	39	0.02	...
28	A	101	1116	Grey	37	...	0.06
29	D	101	1116	Blue	42	0.08	...
30	B	104	1178	Grey	38	0.04	...
31	C	103	1241	Blue	37	...	0.12
32	A	103	1241	Grey	40	...	0.02
33	B	103	1241	Blue	38	0.02	...
34	C	101	1116	Blue	36	...	0.04
35	D	102	1073	Brown	39	...	0.06
36	B	101	1116	Grey	35	0.06	...
37	C	104	1178	Blue	44	...	0.06
38	A	102	1073	Grey	37	...	0.18
39	D	103	1241	Brown	40	0.02	...
40	C	103	1241	Brown	38	...	0.04

raising the question of whether or not the weekly rate should be increased. If this form was returned with the approval of the department manager, a salesperson's record would be examined in detail. Recommendations for increases required the approval of the store manager and the vice-president as well as the department head. A salesperson could ask the personnel manager directly for an increase in salary at any time, and such requests were common.

Early in March, 1953, Mr. Walker had on his desk, awaiting action, three requests for increases in salary resulting from anniversary reviews. The applicants were from different departments of the store, one being from the women's better shoe department, another from the stationery department, and the third from the silverware department. In addition to these three, Mr. Walker had received a personal request for a raise from Mr. Perrin, who handled the selling of boys' shoes.

In considering the merits of requests for increases, Mr. Walker examined first the sales performance of the salespersons. The store maintained records of the salaries and sales of all salespersons in order to facilitate fair judgment of their accomplishments, since clearly the store could afford to pay higher salaries only to salespeople maintaining a high volume of sales. Greatest attention was paid to the direct selling expense ratio; that is, selling salaries plus commissions divided by sales volume. This expense ratio was recorded by months for each salesperson. Store executives regularly examined this ratio for departments and for the store as a whole. In 1952, the sales-expense ratio for the store as a whole had been 6.3 per cent. Pressure was constantly maintained to reduce the selling costs of the store, and for this reason the expense ratio for individual salespeople was examined with care.

Sales and Expense Data

Of the four salespeople whose salaries were under review, the lowest expense ratio was that of Miss Marsten, who was employed in the silverware department. In the year ended January 31, 1953,[3] Miss Marsten sold $71,107 worth of merchandise. Her salary payments during the year totaled $1,350, and she earned $711 in commissions. Thus, total selling costs were $2,061, which was 2.9 per cent of sales. Miss Young in the women's better shoe department had been paid $2,254, plus commissions of $433 during the same period. The total was 6.2 per cent of her sales volume of $43,322. Salary payments to Mr. Dagmar in the stationery department amounted to $1,148 and commissions to $238.

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[3] Like many department stores, C. R. Hayes, Inc., maintained records for fiscal years running from February 1 through January 31, rather than for the calendar year from January 1 through December 31. The term "1952" as used in this case refers to the year ended January 31, 1953.

These selling costs were 5.8 per cent of his selling volume of $23,820. Mr. Perrin, who was selling boys' shoes, was paid a salary of $2,340 and commissions of $235. His selling expense ratio was 11.0 per cent of a sales volume of $23,470.

In addition to salary and commission, shoe salespeople were able to gain extra pay by selling merchandise which the store wished to move. These special bonuses for sales of "premium merchandise" were called P.M.'s. Such premium payments were not classed with salaries and commissions in calculating expense ratios and, therefore, had no bearing on the performance record of the various salespeople. In 1952, Miss Young received $112 in P.M.'s and Mr. Perrin received $110.

In terms of service, Mr. Perrin had been with the store the longest, having come on December 4, 1924; Miss Marsten joined the store in February, 1934; Miss Young came in January, 1943; and Mr. Dagmar had been with the store only since December, 1951.

The sales records of these four salespeople for the three years, 1950, 1951, and 1952, are shown in Exhibit 1 with similar records for other salespeople in the respective departments and in one additional department. The sales figure for each department as a whole is in every instance larger than the sum of the sales of the salespeople listed, for several reasons. C. R. Hayes, Inc., in common with many other department stores, was open for business more than fifty hours a week, whereas the regular full-time salespeople were employed for a forty-hour workweek. This required the use of short-hour and extra people, a group in which there was considerable turnover. Members of the store's flying squad also were used to supplement the regulars when additional salespeople were required. The selling expense ratio for each department reflected wage payments (including commissions and vacation pay to regulars) for all the selling man-hours used in relation to total departmental sales.

The Departments Involved

In examining the merits of the four applicants, Mr. Walker had to consider other information. For one thing, the physical arrangements for selling were by no means the same in all departments. In the better shoe department, salespeople could serve any customer at any point on the floor. Shoe salespeople were not behind counters as were the salespeople in the silverware department. Also, since selling shoes required some intimate knowledge of proper fitting, styles, and so forth, frequently the customer would ask for the services of a particular person.

The silverware department, manned regularly by four full-time salespeople, sold hollow ware, flatware, and small novelty and gift items. Whereas everyone was allowed to sell any of the merchandise, the position of the cash drawers operated by the several persons actually resulted in "station selling," with the old-timers responsible for the flat and hollow ware, and the newer people taking care of the novelty items. This department was particularly busy at certain times of the year when special promotions were made.

In the stationery department a variety of goods were sold, ranging from card tables to cameras. The arrangement of selling space in this department was not particularly good. On one side of the department were two long counters back to back with stationery displayed and sold on both sides. Access to the position behind the counters was at the ends only. To the right of this double counter were several aisle tables from which department items were sold. In addition, a facing wall counter beyond the aisle tables was provided, this position being used, as of 1952, for the sales of greeting cards at one end and cameras and related equipment and supplies at the other. Mr. Dagmar, in charge of the cameras, was the employee here whose compensation was up for review. The camera section of the stationery department had been established February 1, 1952.

Mr. Perrin was the only regular salesman in the boys' shoe department, which was a small department located next to the boys' clothing department. If a customer was waiting to be sold boys' clothing and Mr. Perrin was not busy, he could step across the aisle to make the sales in the other department and would receive credit for such sales. When Mr. Perrin had first joined the store, he had sold men's clothing. During World War II and the years following, he had been working on a straight commission basis, which, in a period of high consumer demand, yielded a substantially larger income than did the commissions received in many of the other departments. In 1948, he had been transferred to the boys' shoe department where the compensation method used was salary plus 1 per cent of sales. Thus his earnings had been considerably reduced, and he was anxious to obtain a salary increase. Mr. Walker, on inquiring of a noncompeting department store, found that its expense ratio was 10 per cent in the boys' shoe department, where two people were employed.

Merchandise sold in the various departments was priced at different levels, and the unit sales usually varied accordingly. The dollars per sales check in the silverware department averaged $12 in 1952; in the stationery department, the average sales check was $1.40; in the

Exhibit 1

C. R. HAYES, INC.

Direct Selling Expense Ratio and Related Data, by Individual Salespeople, Five Departments

Department	Direct Selling Expense Ratio			Sales			Entrance Date	Date of Last Raise	Base Rate per Week 1952
	1950	1951	1952	1950	1951	1952			
Women's Better Shoe:									
Entire department	8.5%	7.9%	8.6%	$440,091	$462,093	$464,461			
Miss Clark	8.4	7.7	7.7	30,112	33,119	34,201	2/37	2/50	$45.50
Mr. Enders	8.4	8.1	8.3	33,201	35,901	36,090	9/49	9/52	52.50
Mr. Elliot	7.9	7.5	8.2	36,190	39,712	38,076	10/40	10/52	52.50
Miss Aspinwald*	7.5	7.2	7.4	29,211	31,019	30,180	9/19	9/49	40.00
Mr. Smith	7.4	7.1	7.4	38,109	40,781	41,211	2/39	2/52	52.50
Miss Sanders	7.0	6.7	6.7	44,921	46,753	47,063	12/42	12/49	55.00
Mr. Hanking	8.1	8.1	8.6	34,724	36,651	36,102	5/49	5/52	52.50
Miss Johnson	7.8	7.2	7.1	35,092	38,920	40,610	11/38	11/50	48.00
Miss Young†	6.8	6.5	6.2	39,651	41,786	43,322	1/43	1/50	49.00
Boys' Shoes:									
Mr. Perrin†	11.5	11.2	11.0	$ 21,300	$ 22,018	$ 23,470	12/24	.....	$45.00
Stationery:									
Entire department	8.2	7.1	6.6	$175,096	$207,902	$284,410			
Miss Bard	10.0	10.0	9.0	14,208	14,421	16,449	11/49	11/50	$27.50
Miss Cox	8.1	7.3	6.7	17,556	21,360	23,994	3/31	3/49	27.50
Mr. Dagmar†	..	..	5.8	......	......	23,820	12/51	.....	28.00
Miss Dorn	..	6.3	5.8	......	25,406	28,765	9/50	.....	29.00
Miss Gorden	6.4	5.7	5.0	20,422	24,076	25,039	8/38	8/50	27.00
Miss Scott	7.5	6.9	6.0	18,490	20,100	23,868	3/43	3/49	27.50
Miss Seick	5.8	5.8	5.1	26,750	27,281	32,478	4/49	4/50	28.00
Silverware:									
Entire department	5.4	4.3	4.5	$154,123	$212,098	$237,002			
Miss Hitchkock	3.8	3.2	3.2	50,027	62,039	65,811	1/33	1/49	$29.50
Miss Marsten†	3.6	3.2	2.9	53,032	67,012	71,107	2/34	2/50	30.00
Miss Santos	..	5.7	4.8	......	27,032	35,001	1/51	.....	26.00
Miss Morse	..	..	5.1	......	......	20,119	4/52	.....	26.00
Women's and Children's Hosiery:									
Entire department	5.7	6.3	6.5	$330,070	$325,009	$301,204			
Miss Austin*	6.4	7.1	9.1	23,516	22,066	15,296	3/49	.....	$27.00
Miss Banter	6.0	5.2	4.9	27,590	33,079	37,209	12/48	12/50	29.00
Miss Boyle	4.8	4.7	5.3	38,501	38,902	30,190	10/49	.....	30.00
Mrs. Epstein	6.4	6.9	7.3	27,750	27,333	25,977	8/39	8/49	32.50
Mrs. Hawkes	5.2	4.9	5.0	38,010	42,010	41,494	3/49	.....	34.50
Miss Moore	5.5	5.8	6.5	36,597	36,076	32,486	10/40	10/50	34.50
Miss Oppenheimer	5.0	5.2	5.9	32,096	31,252	26,035	12/48	12/50	27.50
Entire Store—All Selling Departments	5.7	5.7	6.3						

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* Part-time worker.

† Salary under review.

women's shoe department, it was $10.29; and in the boys' shoe department, it was $7.00.

Miscellaneous Information

The personnel department had the full history of each salesperson's performance. Records were kept on absences, tardiness, and on any infringements of the store rules. In addition, the department managers were asked to rate the salespeople in their department as to sales ability, stock care, co-operation, and general suitability. The rating of sales ability was supposed to take into account sales volume, credits (merchandise returned), merchandise knowledge, and service. "Stock care" referred to the salesperson's method of handling merchandise and keeping stock in good order. In judging co-operation the managers were supposed to consider the salesperson's record in the carrying out of store rules, compliance with instructions, punctuality, helpfulness to others, and special effort. In rating suitability the managers considered the fitness, by type, appearance, and so forth, of the salesperson for the particular department and position from the point of view of both the customer and the store. The records on these points for the four people whose salaries were under review were satisfactory.

The employees of C. R. Hayes, Inc., had been organized into a store union since the middle of 1936. This was an independent union, not affiliated with any other labor organization, and was the outgrowth of an old co-operative union which had been established in the store. The union had taken no position in regard to the four cases being reviewed by Mr. Walker.

Questions

1. There are many "yardsticks" against which the performance of the four employees being considered for raises can be compared. For example, their selling expense ratios can be compared with the over-all ratio for the store, with the average ratio for the department, with ratios for prior years, and so on. Which of these yardsticks is of most significance to Mr. Walker?

2. What action should Mr. Walker recommend with respect to each of the four employees being considered for raises?

CASE 1–3. MASSACHUSETTS BUSINESS DEVELOPMENT CORPORATION

At a meeting in May, 1954, the executive committee of the Massachusetts Business Development Corporation was considering a request for a ten-year loan of $80,000 from the Quality Weldments Company of Quincy. The loan, which would be payable in ten annual installments, would carry interest at 6 per cent. Quality Weldments wanted the loan to help finance a move to new quarters, which it estimated would cost $118,000. It hoped to finance this amount as follows:

MBDC Loan	$ 80,000
Northeastern National Bank	13,000
Additional loans from stockholders	25,000
	$118,000

Massachusetts Business Development Corporation

The Massachusetts Business Development Corporation was created by a special act of the Massachusetts legislature in July, 1953. Its purpose was to promote economic activity in Massachusetts by providing local industries with financing of a type otherwise not readily available. The corporation derived its funds from the sale of its stock and from loans made by co-operating financial institutions. In 1954 it had several million dollars available, which was believed to be adequate to meet all sound requests for loans that were pending at that time.

Many Massachusetts business leaders were included among the incorporators of the company. The executive committee consisted of nine men prominent in industrial and financial affairs in the state.

Quality Weldments Company

The Quality Weldments Company operated a small metal fabrication shop in Quincy specializing in the production of steel weldments. The production of weldments, which are used in many cases to replace castings, was a comparatively new industry in 1954. Six or eight firms, including Quality Weldments, produced almost all the weldments sold in the New England market. Production of weldments required a much higher degree of skill and technical knowledge than was found in the typical welding shop.

The company was formed in 1946 by two engineering graduates of Tufts College. Mr. Michael A. Cifrino, who was thirty-six in 1954, handled sales and administration. After graduation from Tufts, Mr. Cifrino had worked as an engineer on the Panama Canal and had served three years in the Navy. Mr. John P. Parks, who was forty-one, was in charge of engineering and production. Prior to joining Quality Weldments, he had worked for eight years as a welding engineer at the Boston Naval Shipyard.

The Quincy plant was the company's second location. An earlier move had been made in 1951 when the company's original quarters had become inadequate. There were 10,000 square feet of usable space in the Quincy building. The company occupied the property under a lease

Exhibit 1

MASSACHUSETTS BUSINESS DEVELOPMENT CORPORATION

Comparative Income Statements: Quality Weldments Company

	Fiscal Year Ending August 31			6 Mos. Ending February 28	
	1951	1952	1953	1953	1954
Net sales	$174,339	$297,137	$349,540	$163,721	$249,556
Cost of goods sold (see Exhibit 2)	139,010	270,224	300,572	130,476	208,623
Gross profit	$ 35,329	$ 26,913	$ 48,968	$ 33,245	$ 40,933
Selling, administrative, and general expense	11,004	19,070	26,978	12,136	19,464
Net income from operations	$ 24,325	$ 7,843	$ 21,990	$ 21,109	$ 21,469
Other charges against income	20,577	515	2,695	1,229	1,741
Net income before taxes	$ 3,748	$ 7,328	$ 19,295	$ 19,880	$ 19,728
Federal and state taxes on income	1,516	2,960	6,942	7,173	7,102
Net Income	$ 2,232	$ 4,368	$ 12,353	$ 12,707	$ 12,626

Exhibit 2

MASSACHUSETTS BUSINESS DEVELOPMENT CORPORATION

Analysis of Cost of Goods Sold: Quality Weldments Company

	Fiscal Year Ending August 31			6 Mos. Ending February 28	
	1951	1952	1953	1953	1954
Inventory, beginning of period	Not Available	$ 14,017	$ 11,262	$ 11,262	$ 24,132
Purchase of raw materials		103,570	102,208	43,413	73,369
Paid to subcontractors		7,850	10,208	5,132	8,389
Paid to labor		90,857	118,508	54,541	91,093
Factory expense*		65,192	82,517	33,620	57,206
Total		$281,486	$324,704	$147,968	$254,189
Less: Inventory, end of period		11,262	24,132	17,492	45,566
Cost of Goods Sold		$270,224	$300,572	$130,476	$208,623

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* Factory expense includes Mr. Parks' salaries (about $13,000 in 1953); depreciation; rent, heat, light, and power; and maintenance and repairs. Mr. Cifrino's salary (about $13,500 in 1953) was included in selling, general, and administrative expense.

Exhibit 3

MASSACHUSETTS BUSINESS DEVELOPMENT CORPORATION

Comparative Balance Sheets: Quality Weldments Company

	August 31			Feb. 28, 1954
	1951	1952	1953	
ASSETS				
Current Assets:				
Cash	$ 8,381	$12,772	$ 16,241	$ 15,788
Accounts receivable	8,455	18,388	25,675	43,268
Inventories	14,017	11,262	24,132	45,566
Prepaid rent	1,250	1,250	1,250	1,250
Total Current Assets	$32,103	$43,672	$ 67,298	$105,872
Fixed Assets:				
Machinery and equipment	$19,256	$38,206	$ 42,684	$ 46,710
Jigs and tools	738	850	850	850
Office equipment	745	955	955	955
Autos	.....	1,980	4,178	4,178
Total Fixed Assets	$20,739	$41,991	$ 48,667	$ 52,693
Less: Accumulated depreciation	6,022	8,872	13,604	16,435
Net Fixed Assets	$14,717	$33,119	$ 35,063	$ 36,258
Deferred Charges	886	430	430	430
Total	$47,706	$77,221	$102,791	$142,560
LIABILITIES AND NET WORTH				
Current Liabilities:				
Notes payable to bank—unsecured	$ 850	$ 5,825	$ 1,750	$ 18,500
Notes payable to bank—equip. oblig.	.....	1,017	4,569	2,697
Accounts payable	5,305	16,951	21,130	26,841
Taxes withheld from employees	722	2,665	1,881	2,459
Accrued expenses	2,768	3,282	3,395	3,348
Federal and state income taxes	908	2,960	6,942	9,965
Total Current Liabilities	$10,553	$32,700	$ 39,667	$ 63,810
Notes payable to stockholders	19,000	22,000	23,250	26,250
Total Liabilities	$29,553	$54,700	$ 62,917	$ 90,060
Net Worth:				
Capital stock	$12,500	$12,500	$ 17,500	$ 17,500
Retained earnings	5,653	10,021	22,374	35,000
Total Net Worth	$18,153	$22,521	$ 39,874	$ 52,500
Total	$47,706	$77,221	$102,791	$142,560

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running until November, 1955, which called for monthly rental payments of $750. Under the terms of the lease, the company was required

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to supply its own utilities and services and to maintain the building in good shape.

The company's sales had quadrupled between 1949 and 1952. Messrs. Cifrino and Parks expected the growth in sales to continue. They pointed out that Lincoln Electric Company, a leading producer of weldments, estimated that only one quarter of the potential New England market had been tapped.

Recent financial information about the company is given in Exhibits 1, 2, and 3.

Proposed Relocation

By the spring of 1954, the company had again outgrown its plant and was searching for a new location. In order to be closer to its major customers, the company looked for a site near Worcester, Massachusetts. The building selected contained about 12,500 square feet of usable space on a plot of approximately ten acres. The property, which could be purchased outright for $30,000, had recently been appraised by a local bank at $42,000. Property taxes were approximately $300 a year. Messrs. Cifrino and Parks considered the physical facilities in the new building to be ideal for their purposes.

In addition to the purchase price, the company estimated it would have to spend about $68,000 in refitting the building and in moving its equipment (see Exhibit 4). It also hoped to buy a new power shear for $20,000; this would permit it to purchase steel directly from the producers rather than through jobbers, with a consequent saving in cost.

Exhibit 4

MASSACHUSETTS BUSINESS
DEVELOPMENT CORPORATION

Detail of Moving and Refitting Expenses:
Quality Weldments Company

Moving expense	$14,000
Bridges and cranes	22,500
Electrical wiring	10,000
New floor	4,500
Outside racks and cranes	4,500
Heating system	3,750
Installation of equipment	2,250
Office	2,250
Paint and blastrooms	1,500
Manifolds	1,500
Washrooms	1,250
	$68,000

If the move was made, the company expected to save approximately $26,000 annually at its present volume of sales. Of this amount, $10,000 would result from the direct purchase of steel which would be made possible by use of the power shear. The balance would result from elimination of overtime work in the new plant. Because of the crowded conditions at Quincy, it was frequently necessary to employ labor at premium rates in order to finish jobs by the time they had been promised.

The company would have to replace most of its sixty production employees if it moved to Worcester. In addition, it planned to increase its labor force by twelve to eighteen employees. Since there was some unemployment in the Worcester area, no problem was expected in hiring new workers. Most of the company's supervisory employees had expressed a willingness to move with the company.

Investigation by MBDC

In addition to the information contained in the company's loan application, the executive committee had received a report from Mr. F. P. Brennan, chief examiner of MBDC. Mr. Brennan had visited the company and was impressed by the technical and administrative abilities of Messrs. Cifrino and Parks, whom he termed "capable and aggressive." He believed that management of their caliber was unusual in a company the size of Quality Weldments.

Mr. Brennan looked over the list of the company's customers. It included many large firms with national reputations and excellent credit ratings. Many of these companies had become customers of Quality Weldments relatively recently. At the end of April, the company had unfilled orders of about $115,000.

Mr. Brennan also visited the Northeastern National Bank. The loan officer at the bank confirmed the bank's intention to finance two thirds of the cost of the power shear on a three-year basis. In addition, the bank indicated its willingness to finance the company's seasonal working capital needs. The bank did not feel that it could finance the new building and the moving expenses, however, in view of the long repayment period which would be required. The loan officer pointed out to Mr. Brennan that the size of the financing required was considerably larger than any amount the company had previously borrowed and was also large relative to the size of the company.

At Mr. Brennan's request, the bank supplied a letter to be included with the loan application. Excerpts from the letter follow:

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It is our opinion that the management is well above that of comparable concerns and has used its experience and ability to make well thought out and sound decisions. . . .

. . . We feel that the proposed plant relocation and investment program, in spite of the resulting heavy debt to investment ratio, would be a wise move if soundly financed. . . .

Questions

1. What significant information about Quality Weldments Company is revealed by the financial statements?

2. What significant information bearing on the question of approval of the loan, other than from the financial statements, is available to MBDC?

3. Should the $80,000 loan request be approved?

4. In order to reach a decision, does MBDC need additional information? If so, how should it be obtained?

Part I

PRINCIPLES, TECHNIQUES, AND TOOLS

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Chapter

2

ELEMENTARY TECHNIQUES FOR USING NUMBERS

Since accounting is concerned with numerical information, we shall discuss in this chapter some of the techniques that are useful when working with numbers. Collectively, these techniques are a part of the field called *statistics,* but we are here concerned with only a small segment of statistics, in fact, only with certain common statistical techniques that will be found helpful in connection with the cases that follow. The topics to be discussed are: (1) frequency distributions, (2) averages, (3) measures of dispersion, (4) rounding, and (5) significant digits.

FREQUENCY DISTRIBUTIONS

A frequency distribution consists of data classified into groups, with each group including a specified range of numerical values. In a frequency distribution only the number of observations occurring in each group is shown, not the individual values themselves. The grouping of figures into a frequency distribution is a process of summarization in which a certain amount of detail—i.e., the exact value of individual items—is sacrificed in order that significant characteristics of the whole body of data may be more readily grasped.

To illustrate the process, consider the following figures which show sales, in dollars, for twenty-two selected retail stores in the month of May: 14,132; 13,476; 18,247; 15,890; 16,222; 15,048; 15,719; 12,564; 17,388; 18,914; 19,400; 15,934; 12,037; 16,178; 15,459; 15,068; 14,403; 16,682; 17,280; 17,998; 17,409; 16,158. These figures may be arranged as in the following table, which is a frequency distribution:

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Sales Volume	*No. of Stores*
$11,000–$12,999	1
13,000– 14,999	4
15,000– 16,999	9
17,000– 18,999	6
19,000– 20,999	2

Terms used in connection with frequency distributions are described below. The line "$11,000–$12,999," and each of the other lines in the above table, is a *class.* In the first class, $11,000 is the *lower limit* and $12,999 is the *upper limit* (or, more accurately, the upper limit is "up to but not including $13,000"). The *class interval* is the distance from the lower limit of one class to the lower limit of the next class, here $2,000 for each class. In most cases, confusion is avoided if the class interval is identical for all classes in the frequency distribution, as in the above example.

The *midpoint* of a class is, as its name implies, the value in the middle of a class. It can be found by adding one half the class interval to the lower limit of the class. In the example, the midpoint of the second class is $14,000 (found as follows: lower limit = $13,000; ½ class interval = $1,000; $13,000 + $1,000 = $14,000).

The *frequency* of a class is the number of items included in it. The frequency of the second class in the above example is 4, which means that four stores had sales between $13,000 and $14,999.

The degree to which the data should be summarized, i.e., the number of classes included in the frequency distribution, depends on the purpose. If the distribution is to be used to give the reader an over-all impression of the data, the degree of condensation may be greater than if the purpose is to make detailed analyses or computations. When collecting information in the first instance, it is wise to use small class intervals, from which larger intervals may later be formed in multiples if desired; otherwise, detail that subsequently turns out to be needed may be lost.

In selecting class limits, particular attention should be paid to the midpoint that results from the selection. For many purposes, the midpoint of each class is used to represent all the values included in the class. The computation will be subject to less "grouping error" if the frequencies in each class actually do cluster around the midpoint. In wage rate data, for example, certain rates, such as $0.75, $0.80, and $0.85, may appear frequently, while rates such as $0.72, $0.83, $0.87, etc., may be comparatively rare. In cases like this, the class limits should be chosen so that the typical rates become class midpoints. Also, since midpoints are frequently used in later computations, it is well to choose, as midpoints, numbers that are easy to handle. For example, if the class interval is to be 3, choose class limits *not* as 3–5.9, 6–8.9, etc., but as 2.5–5.49, 5.5–8.49, etc. The first choice gives less convenient numbers as midpoints (4.5, 7.5, etc.) than the second, which gives 4, 7, etc.

AVERAGES

A comparison of the frequency distribution of store sales with the twenty-two separate numbers from which it was prepared shows a major reason for grouping data into a frequency distribution: the frequency distribution gives a more easily understood picture of the general characteristics of the data than does the list of twenty-two separate numbers. The data may be compressed still further, however—down to a single number that describes a principal characteristic of the whole series. Such a number is called an *average,* or a measure of central tendency. Three widely used averages are: (1) the *arithmetic mean* or arithmetic average, (2) the *median* or middle figure, and (3) the *mode* or most common value. Methods for computing these are given below.

The Arithmetic Mean

The mean[1] or arithmetic average of a group of values is the sum of the numerical values of the items in the group divided by the number of items in the group. Thus, it is the common average encountered in everyday usage, and often when the word "average" is used, the arithmetic mean is implied.

In estimating the mean of a frequency distribution, the assumption is made that the midpoint of each class is the average value of the items in that class. Thus, in the sales figures given previously there are four items in the class $13,000–$14,999; and the best guess as to the sum of these four values is therefore $14,000 × 4, or $56,000; this assumes that each item with a value above $14,000 will be balanced by another below $14,000. The procedure therefore is: multiply each class midpoint by the frequency of its class; add together the products thus obtained; and divide the result by the sum of the frequencies.

An example, based on the retail sales data, is shown in Illustration 2–1.

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[1] In addition to the arithmetic mean, statisticians also use the *geometric mean* and the *harmonic mean,* but when the word "mean" is used without a modifier, it should be read as referring to the arithmetic mean.

Illustration 2–1

Sales (1)	Midpoint (2)	No. of Stores (Frequency) (3)	(2) × (3)
$11,000–$12,999	$12,000	1	$ 12,000
13,000– 14,999	14,000	4	56,000
15,000– 16,999	16,000	9	144,000
17,000– 18,999	18,000	6	108,000
19,000– 20,999	20,000	2	40,000
		22	$360,000

$$\text{Mean} = \frac{\$360{,}000}{22} = \$16{,}400$$

The Median

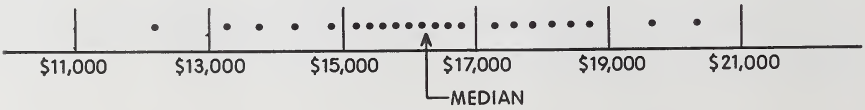
The median is the value in the middle of a group when all the items are arrayed in ascending or descending order of size. When the number of items is odd, there is a unique middle figure which is the median. When the number of items is even, the median lies between the two middle figures and these are usually averaged to obtain the median. As an example, consider the following figures, which are the number of refrigerators sold by each of seven dealers in a certain week, arrayed from lowest to highest:

2, 4, 4, 6, 8, 9, 12.

The median is 6. In other words, the median dealer sold six refrigerators; he is the median, or middle, dealer in that three dealers sold less and an equal number sold more than he did. If there were figures from only six dealers (e.g., if the dealer with sales of twelve were excluded), no one of them is precisely in the middle; in this case, the median is estimated by averaging the two middle figures, 4 and 6, to obtain 5.

The median of a frequency distribution is occasionally estimated simply as the midpoint of the class in which the middle item occurs. A much more accurate method is described below. This method assumes that the items in a given class are equally spaced in value within that class, as pictured in the diagram in Illustration 2–2 showing the retail

Illustration 2–2



sales distribution. The scale is marked off into classes, and the frequencies within any one class are spaced at equal distance from each other. The median is the scale value which divides the items into two equal groups. It can be estimated as follows:

a) Divide the total number of observations by 2. The result is the location of the median value.
b) Find the class containing the median value by adding the frequency of the lowest class to that of the next, until the lower limit of the class containing the median is reached.
c) Find how many items one must count into the class to reach the median value.
d) Convert the number of items found in Step (*c*) into a proportion of all the items in the median class by dividing it by the total frequencies in that class.
e) Multiply this proportion by the class interval and add the result to the lower limit of the class containing the median. The result is the median value.

This procedure is illustrated by the retail sales figures as follows:

a) There are 22 observations, so the location of the median value is 22/2, or 11; that is, the median is 11/22 of the total distance through the distribution.
b) The median value is in the class $15,000–$16,999, since there are five frequencies below this class, and the class contains nine frequencies, which is more than enough to make eleven.
c) We must count 11 − 5, or 6, items into the class to reach the median value.
d) Since the class contains nine items, we assume that the value of the median is 6/9 of the distance from the lower limit.
e) Since the class interval is $2,000, the median value is estimated as (6/9 × $2,000) + $15,000 = $16,300.

The Mode

In the following series of numbers, 2, 3, 4, 4, 6, 6, 6, 6, 6, 8, 12, 14, the mode is 6; this is so because 6 occurs more often than any other number. Strictly speaking, a frequency distribution has no mode since the values of individual observations are not known. The midpoint of the modal class—i.e., the class with the greatest frequency—is often used as an approximation of the mode, however. Thus, for the retail sales figures, the mode is approximately $16,000.

The mode represents the typical value in a distribution, the point of cluster. There may be more than one mode in a series of observations; two modes exist if there are two well-defined peaks or cluster of values, even if one value does not occur quite as frequently as the other.

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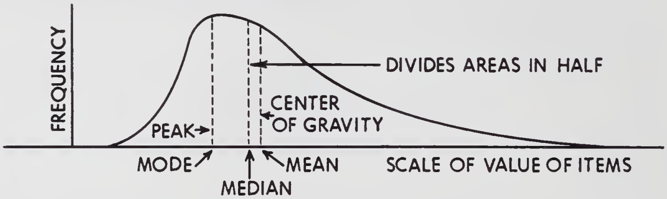
On the other hand, many sets of data, especially when there are relatively few observations, have no well-defined mode.

Graphic Representation of Averages

The relationship between the arithmetic mean, the median, and the mode is shown graphically in Illustration 2–3. The mode occurs at the peak—at the value with the greatest frequency. The median divides the area in halves, with an equal number of items on each side. The mean has the value which lies at the center of gravity along the horizontal direction—with all item values (which are represented by distances on the horizontal scale) affecting it, just as the total spacial distribution of the weight of an object determines its center of gravity.

Illustration 2–3



Use of Averages

Each of the three averages just discussed has advantages and limitations peculiar to itself. No one average will be suitable for all occasions and all purposes. Often it is difficult to decide which one of the three should be used.

The concept of the *median* is one that can easily be understood even by those with no training in statistics. When people speak of the "average man" or the "average company," they usually have the median in mind; that is, they think of the man or the company "in the middle," with half of the group being better (or richer, larger, etc.) than this, and half being worse (or poorer, smaller, etc.). The median also has the advantage of being easy to compute in many cases since all that is required is that the data be arrayed and the middle item selected; no mathematical operations are necessary. The median has the disadvantage that it is derived from the value of only one (or two) of the items in the series; it is not influenced by the numerical values of any of the other items. In some cases, therefore, particularly when the number of observations is small, the median may give a deceptive impression of the character of the whole group.

The *mean* is probably the most widely used measure of central tendency. Although as pointed out above most people have the median in mind when they speak of the "average company," if they were given some figures and were asked to *compute* an average, they would usually compute the mean. The concept of the mean is more elaborate than that of the median in that the mean is determined by the values of all the items in the series. The mean may be thought of in terms of its definition —the sum of the value of all items divided by their number—but this is an abstraction that is difficult to visualize or to relate to concrete situations. Most people are familiar with batting averages and similar arithmetic means, however.

The mean is the only one of the three measures which when multiplied by the number of items will give the total value of the entire series. For example, the *per capita* (or mean) income of dentists multiplied by the number of dentists gives the total income of all dentists; a similar statement cannot be made with respect to the median or mode. The mean is therefore the measure usually chosen when the data are to be subjected to further statistical analysis.

Extreme values may have a greater influence on the mean than their importance warrants. For example, the mean income of a group may be influenced considerably by the incomes of a few extremely wealthy individuals and thus give a misleading impression of the typical income of persons in the group. In such cases, the median or mode may be more typical of the group. Or when a mean is desired, extreme values may be excluded from the items considered in the calculation of the mean to give a *modified arithmetic mean.*

Since the mean cannot be calculated unless the value of all items in the series is known or can be estimated, the mean cannot be determined for a distribution with open-end classes, such as "under $500," "$10,000 and over," etc., unless assumptions are made about the value of items in these classes; the median can easily be found for such distributions.

The *mode,* or most common value, is easy to comprehend in concrete terms. It is often used in such contexts as: "Most people prefer a 21-inch television set," "We sell more suits at $50 than at any other price," etc. The mode is often easy to ascertain. Nevertheless, it is probably used less frequently for statistical analyses than either the median or the mean, since it is rather unstable; that is, it does not exist at all in some series, and in others there may be more than one mode. The fact that a certain value occurs most frequently may be accidental, and the mode therefore may not be a reliable indicator of central tendency.

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MEASURES OF VARIATION

When one value is selected as an average to represent a group, it should be obvious that most individual items are unlikely to equal the one selected. For instance, it may be said that on a certain day the average price of fifty stocks was $94; yet one of the stocks may have sold for as little as $20 and another for as high as $180—or as low as $1 and as high as $500! The extent to which an average represents a group of values depends upon the extent to which the individual values cluster close to that average. An average that is derived from widely scattered values is not as good a description of all the data as one derived from a closely packed group of values.

This spread of values around the central figure of a distribution is called the *dispersion* or *variation.* Measures of dispersion have been developed which indicate in numerical form the deviation of individual values in a group from the average. These measures provide an indication of the usefulness of that average.

There are four principal measures of dispersion: (1) the range, (2) the semi-interquartile range, (3) the average deviation (sometimes called the mean deviation), and (4) the standard deviation. It is not usually necessary, for a given problem, to compute each of the four measures. All of them measure dispersion, each on its own scale. They are alternative approaches to the same end, but each has its own special significance which is important to bear in mind when selecting one.

These four measures are described briefly below so that their general nature will be understood. Detailed directions for computation are not given since such computations are not necessary for the cases with which we shall be dealing.

The Range

The range is probably the most obvious way of expressing the scatter of values in a distribution. It is simply the difference between the lowest value and the highest value. If the data are grouped into a frequency distribution, the range is usually estimated by subtracting the lower limit of the lowest class from the upper limit of the highest class. In some distributions, classes are included which do not have stated limits. For example, the lowest class in a distribution may read "less than $500," or the highest may be "$10,000 and over." In these cases the range is indeterminate.

Significant features of the range are its ease of computation and the fact that it is readily understood. These are important advantages which to some extent are lacking in the other measures of dispersion. The range has some defects, however. Its value is influenced by the values of only two items, the lowest and the highest; all the item values which lie between these extremes are neglected. The two values which the range does reflect are usually the least typical of the whole group, and they are likely to be considerably influenced by accidental variations. For a small number of items, say 5, the range is a useful measure; but for a large number of items the other measures are likely to be more descriptive than the range.

The Semi-interquartile Range

One way to eliminate the disproportionate effect of extreme values which occurs when the range is used is to use only the middle half of the distribution. This involves cutting off the upper and lower quarters of the values and considering the range of the remaining central half. The upper and lower quarters of a distribution are marked off by quartiles, using a technique similar to that used for finding the median. The distance between these quartiles is called the *interquartile range.* Usually one half this distance is taken, since it is a little more convenient to use than the entire distance; this is the semi-interquartile range.

The semi-interquartile range is a convenient measure which can be calculated quickly. Like the full range, however, it depends on the values of only two items in the array.

The Average Deviation

Perhaps a better measure would be one which took into account every value in the distribution. The average deviation does just this. It is found by subtracting the average from each of the values and averaging the differences. In adding the differences, their arithmetic signs (+ or —) are ignored; otherwise the differences would always add to zero. The average used in this calculation may be either the mean or the median.

The Standard Deviation

The standard deviation is similar to the average deviation in that it uses all the item values. It differs in that it weights each deviation by the square of its value; as a result extreme values get weighted much more heavily than those close to the mean.

Although the average deviation makes use of all the values in the series, it does so by disregarding arithmetic (+ or —) signs. This

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is a theoretical weakness which makes the average deviation unsuitable for certain types of statistical manipulation. For statistical calculations in which the objective is simply to express the amount of dispersion in the data, this weakness is unimportant. For many more advanced calculations, especially those made as a basis for drawing statistical inferences, the standard deviation, which does not disregard arithmetic signs, is a better measure of dispersion. Its computation, however, is relatively time consuming.

ROUNDING

Rounding is dropping some of the digits at the right-hand portion of a number. Thus, on highway sign posts 22.16 miles would be reported as 22, and we often say an automobile cost $2,800, even though its exact price was, perhaps, $2,793.55.

The rules for rounding suggested for your use are as follows:

1. In rounding numbers, a digit *less than 5* or a *fraction less than one half* is discarded; a digit *greater than 5* or a *fraction more than one half* adds 1 to the digit next to the left. For example, 12.7 is rounded to 13; 12.4 to 12; and 12,501 to 13,000.
2. When an *even 5* or the *fraction* ½ is to be dropped, the digit to the left, if *even,* is unchanged; if *odd,* it is raised by one. Under this rule, all numbers which have been rounded by dropping an even 5 or the fraction ½ will be reported as even numbers: thus 11½ is rounded to 12; 12½ to 12; 13½ to 14; 87½ to 88; and 12,500 to 12,000. Some people follow the practice of raising all numbers ending in 5 or ½ by one. This rule introduces a slight upward bias in the rounding process, and its use as a general rule of rounding is therefore not recommended.

Rounding is a process which can be of great help in the use and interpretation of figures. Most people find it difficult to think in terms of large numbers. For example, a speaker may state that a certain expenditure was two billion, one hundred ninety-one million, four hundred thirteen thousand, two hundred seventy-six dollars and twenty-three cents. By the time he has finished, the strongest impression remaining with his audience is "23 cents," the least important part of the entire figure. It is much more effective to report such a figure as "2 billion dollars" or "2.2 billion dollars."

In other circumstances, limits of accuracy call for rounding. Where digits included in a number are not known to be correct, they should be dropped and the remaining figures which are known to be correct should be rounded, as described below.

SIGNIFICANT DIGITS

The significant digits in a number are the digits known to be correct (although the last digit, i.e., the farthest to the right, may often be only an approximation). In considering the problem of determining how many significant digits should be reported, it is helpful to remember that there are two kinds of numbers: (1) those which represent a *count,* and (2) those which represent a *measurement* or estimate. Examples of the first type are "three children," "1,067 students," "twelve months." These numbers are said to be discontinuous or discrete; that is, there is a gap or space between each number (e.g., there cannot be "three and a fraction" children; the next number has to be four). Counts, or discrete numbers, are completely significant; that is, every digit has significance.

On the other hand, many of the numbers used in accounting are *measurements,* and all measurements are approximations. Their significance is limited by the accuracy of the measuring rod or of the observer. When a man views a tower from a distance and judges its height to be 500 feet, he may mean that in his opinion the tower is closer to 500 than to either 400 or 600 feet. When this is the intended meaning, the number 500 has only one significant digit, 5; the zeros were inserted merely to locate the decimal point.

A second man might estimate the tower's height as 520 feet, by which he means that it is closer to 520 than to either 510 or 530 feet. The degree of reported uncertainty has been considerably reduced in this estimate, and this is shown by the fact that the number now has two significant digits, 5 and 2. The zero once again does not represent a measurement but is used only to locate the decimal point. If the second man is in fact a keener observer than the first, his measurement is more accurate; it has more significant digits. The use of even better observers and more refined measuring instruments can increase the accuracy in successive stages, for example: 500, 520, 523, 522.8, 522.81. The number of significant digits thus increases from 1 to 5. However, there is always some limit to accuracy; even radar, which measures the timing of electrical waves in terms of millionths of a second, is not precisely accurate.

The following rules are helpful in counting the significant digits in a number, subject to the qualification explained in the next paragraph.

1. All digits other than *zeros* are significant.
2. Zeros are not significant when:

a) They are at the extreme left of a number (0.0019); or,

b) They are at the extreme right of a number *and* at the left of the decimal point (19,000).

Thus, the number 0.0019 and the number 19,000 each have two significant digits. The number 4,203 has four, and 500.00 has five significant digits. (Note that zeroes to the right of the decimal point indicate that all digits to the left are significant.)

These rules are not sufficient for all cases. A person might give a measurement as 500 feet and really mean "closer to 500 than to 499 or 501." In this context, 500 has three significant digits. In situations of this kind, the significance can be inferred only from the context and not solely from the number and location of zeroes.

Many figures used in business are estimates and are accordingly subject to error. However, additional error is introduced and a false appearance of accuracy is given if an unwarranted number of digits is reported. Suppose four men, A, B, C, and D, take an inventory of a potato warehouse. In the sections covered by A, B, and C, the potatoes are packed in 100-pound sacks, and the three men determine by counting the sacks that there are in their respective sections 131,200; 258,300; and 72,600 pounds of potatoes. But D's section consists of a pile of potatoes that have not been sacked, and D *estimates* (from measurements of its size) that this pile contains 320,000 pounds of potatoes. In reporting a figure with two significant digits, D presumably means that the pile measures closer to 320,000 pounds than to either 310,000 pounds or to 330,000 pounds, but that he is unable to give an estimate closer than plus-or-minus 5,000 pounds. How many pounds of potatoes are in the warehouse? The way to arrive at the answer is to add up the reports of the four men:

131,200	A (by count)
258,300	B (by count)
72,600	C (by count)
320,000	D (by estimate)
782,100	

This answer should be reported, however, *not* as 782,100 pounds but rather as 780,000 pounds. As explained below a sum cannot be more accurate (i.e., have more significant digits) than the least accurate number from which it was derived. In this case, the least accurate number is D's estimate of 320,000 pounds, and this has only two significant digits. Stated in another way, the figure of 782,100 pounds is not correct because it implies that the quantity of potatoes in the warehouse has been estimated within plus-or-minus 50 pounds, whereas D's estimate may be in error by as much as 5,000 pounds on either side. The number, 782,100 pounds, gives a false appearance of accuracy.

Rules

The following rules for treatment of significant digits are worth noting:

1. In *multiplication and division* the number of significant digits in a product or quotient is not more than the number of significant digits in the less significant of the two numbers entering into the calculation.

That figure is less significant which has the smaller number of significant digits. The controlling factor in multiplication and division is the number of significant digits and not the number of decimal places (i.e., digits beyond the decimal point). For example, 91,100 tons per year is equal to 7,590 tons per month since 91,100 (with three significant digits) divided by the whole number 12 gives an answer with three significant digits. Although 91,100 divided by 12 equals 7,591.6666⅔, the figure should not be reported in a final answer as being more significant than 7,590. Note that in the above example, 91,100 is the less significant of the two figures since the other number, 12, is significant to an infinite number of places. (There are exactly 12.000 . . . months in a year.)

2. In *addition and subtraction* the answer contains no more correct decimal places than those in the least accurate of the numbers. Thus, in addition and subtraction it is the number of significant digits with reference to the decimal place that governs. For example, $25,000 plus $1,000 (both estimates) equals $26,000; and $25,000 (an estimate) plus $1,312.21 (six significant digits) equals $26,000.

Following these rules will still not guarantee the same degree of accuracy as a scientist would require; however, they are accurate enough for most business purposes.[2]

Use of the Rules

Application of these rules does not require that digits without significance always be dropped, especially in intermediate stages of the calculation. It is usually desirable to retain one and perhaps two digits

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[2] For some purposes, the significance of an answer is determined by using the maximum *percentage* of error in each figure in the calculation. This is a more precise statement of the rule than that given here, but it is also more complicated to apply. Considering zeros as insignificant, as is done here, will usually give satisfactory results.

beyond the number that is significant. At each stage of the work, however, all digits that have no influence on the final result should be rejected. In the final answer all digits that are not significant should be eliminated by the process of rounding.

For example, consider the following problem: a production manager is told that sales for an item for the next year are estimated to be approximately 900,000 units (significant to one digit) and that this item will be discontinued at the end of that time because of the introduction of a new model. The present inventory, by physical count, is 255,456 units. The estimated direct cost of manufacturing is $0.19 per unit. What is the cost of manufacturing the units required to meet anticipated sales?

Calculation: Step No. 1		
	900,000	Estimated sales
	−255,456	Inventory
	644,544	Needed production

This number is significant to only one digit, or 600,000, because the sales estimate has only one significant digit. Nevertheless, one additional digit is retained for the next step.

Step No. 2: 640,000 units × $0.19 = $121,600

In reporting the answer, only one significant figure is used, making the estimated cost $100,000. Notice that the number of significant figures in the answer was determined by the least accurate figure (900,000) involved.

It is well to remember also that these rules of significant numbers and rounding are mathematical and in many instances must be applied with common sense. For example, custom within a given company or industry may have established rule-of-thumb methods for accomplishing similar results. In most cases unless those rule-of-thumb methods give results which are entirely inaccurate, it is wise to accept the common practice of the particular organization within which the work is being performed. In the preceding calculation, for instance, many people would insist on reporting the result as $120,000, or even as $121,600, and would criticize anyone who reported only the rounded figure. It often is discreet to conform to their wishes.

In the application of the above rules, some sticky problems arise. Fortunately, most of these are of academic, rather than practical, importance. In a practical situation, reporting one digit more or less than those that actually are significant makes little real difference. The important thing is to recognize that no amount of calculating will make a precise conclusion out of a rough estimate and to temper one's attitude toward the numbers accordingly.

SUGGESTIONS FOR FURTHER READING

See any of the standard textbooks in statistics for additional material on the topics mentioned in this chapter. Among these are:

CROXTON, F. E., and COWDEN, D. J. *Applied General Statistics.* 2nd ed. New York: Prentice-Hall, Inc., 1955.

MORONEY, J. J. *Facts from Figures.* Baltimore Md.: Penguin Books, 1951.

SPURR, W. A., KELLOG, L. S., and SMITH, J. H. *Business and Economic Statistics.* Homewood, Ill.: Richard D. Irwin, Inc., 1954.

WALLIS, W. A., and ROBERTS, H. V. *Statistics: A New Approach.* Glencoe, Ill.: The Free Press, 1956.

For students who have forgotten the elements of arithmetic or algebra, the following inexpensive book is a good refresher:

BASIC NAVY TRAINING COURSES. *Mathematics.* Vol. II, NavPers 10070-A. Washington, D.C.: U.S. Government Printing Office, 1949.

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Chapter

3

BASIC ACCOUNTING CONCEPTS

Suppose you were given the job of devising a method of keeping track of what was going on in a business so as to provide useful information for management, and suppose further that you had no knowledge of the methods other people used to keep track of the events in their businesses. One way of carrying out such an assignment would be to write down a narrative of important events in a diary or in a log similar to that kept by the captain of a ship. After some experience with your log or diary, you would gradually develop a set of rules to guide your efforts. Obviously, it would be impossible to write down every action of every person in the business, so you would frame rules to guide you in choosing between those events that were important enough to record and those that should be omitted.

You would also find that your log would be made more valuable if you standardized certain terminology. People who read your diary would then have a clearer understanding of what you meant. Furthermore, if you standardized terms and definitions of these terms, you could turn the job of keeping the diary over to someone else and have some assurance that his report of events would convey the same information that you would have conveyed had you been keeping the diary personally.

In devising these rules of keeping a diary, you would necessarily have to be somewhat arbitrary. There might be several ways of describing a certain event, all equally good; but in order to have a common basis of understanding, you would select just one of these for use in your record-keeping system.

All the foregoing considerations were actually involved in the development of accounting, which is the name given to the most commonly used system of maintaining a record of events in a business. Accounting has evolved over a period of several hundred years, and during this time certain rules and conventions have come to be accepted as useful. If you are to understand accounting reports—the end products of an accounting system—you must be familiar with the rules and conventions lying behind these reports. The purpose of this and the next five chapters is to describe the more common of these rules and conventions.

Accounting as a Language

Accounting has been called the "language of business," and while there are those who would quarrel with this definition, you will find that the task of learning accounting is essentially the same as the task of learning a new language.

This task is complicated, however, by the fact that many of the words used in accounting mean almost, but not quite, the same thing as the identical word means in everyday, nonaccounting usage. If you are an American learning French, you realize from the beginning that the words and the grammar in French are completely new to you and must therefore be learned carefully. The problem of learning accounting, however, is more like that of an American learning to speak English as it is spoken in Great Britain; unless he is careful, the American will fail to recognize that words are used in Great Britain in a different sense than they are used in America. For example, the grain that Americans call "wheat" is called "corn" by the British, and the British use the word "maize" for the grain that Americans call "corn." To complicate the matter further, a grain grown in certain parts of America is called "maize," and it is almost, but not quite, like corn. Unless he understands these differences in terminology, an American will be confused when talking with an Englishman.

Perhaps the greatest difficulty that a beginning student of accounting encounters is that of distinguishing between the accounting meaning of certain terms and the meaning that he has attached to these terms in their nonaccounting, everyday usage.

Accounting also resembles a language in that some of its rules are definite, whereas others are not, and there is disagreement among accountants as to how a given event should be recorded, just as there is disagreement among grammarians as to many matters of sentence structure, punctuation, and choice of words. On the other hand, even though there are disagreements on some points, there are many practices which are clearly "poor English," and there are also many practices that are definitely "poor accounting." In these chapters, therefore, an attempt is made to describe the elements of "good accounting" and to indicate areas in which there are differences of opinion as to what constitutes good practice.

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Finally, languages evolve and change in response to the changing needs of society, and so does accounting. The rules described here are rules currently in use, but it is to be expected that at least some of them will gradually be modified to meet the changing needs of business.

UNDERLYING PRINCIPLES

The rules and conventions of accounting are commonly referred to as "principles." The word "principle" is here used to mean: "A general law or rule adopted or professed as a guide to action; a settled ground or basis of conduct or practice."[1] Note that this definition describes an accounting principle as a *general* law or rule which is to be used as a *guide* to action; that is, accounting principles do not prescribe exactly how each detailed event occurring in a business should be recorded. Consequently, there are a great many matters in respect to which accounting practice differs from one company to another. In part, these differences are inevitable because a single detailed set of rules could not conceivably apply to every company. In part, the differences reflect the fact that the accountant has considerable latitude within the "generally accepted accounting principles" in which to express his own idea as to the best way of recording and reporting a specific event.

The student should realize therefore that he cannot know the precise meaning of many of the items on an accounting report unless he knows which of several equally good possibilities has been selected by the person who prepared the report. For example, as mentioned in Chapter 1, the simple word "cost" has a half a dozen different meanings, and there is agreement on the definition of this word only in the broadest sense.

Accounting principles are not codified in a single source that resembles, either in the amount of detail or in its authority, the codification of legal principles on which lawyers rely so heavily. Perhaps the most widely recognized authority is the series of *Accounting Research Bulletins* and *Accounting Terminology Bulletins* issued by the Committee on Accounting Procedure of the American Institute of Accountants. Approximately fifty of these bulletins have been published; the principles set forth in each bulletin vary in length from a paragraph to a few pages. Even briefer statements are issued by the "Standards Committees" of the American Accounting Association. A third widely used source of statements about accounting principles is the *Accounting Series Releases* of the U.S. Securities and Exchange Commission. All these sources together contain far fewer words than a single one of the law books that fill shelf after shelf in a lawyer's office.

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[1] American Institute of Accountants, *Accounting Terminology Bulletin No. 1,* p. 9.

Listed below are five principles or concepts that are basic to an understanding of accounting. They are so basic that most accountants do not consciously refer to them. Some of these principles are currently undergoing a critical re-examination by the profession, but in this initial contact with them, the student is asked to understand and accept them rather than to criticize them. As is the case with a language, the student can criticize the way certain words are spelled (e.g., "bough," "cough," "doff,"), but the fact remains that the words *are* spelled in a certain way, and if he is to use the language effectively, the student must understand what is done.

1. Dollars, the Common Denominator

In accounting, a record is made only of those facts that can be expressed in monetary terms. This concept imposes a severe limitation on the scope of an accounting report. Accounting does not, for example, record the state of the president's health; it does not record the fact that the sales manager is not on speaking terms with the production manager; it does not report that a strike is beginning; and it does not reveal that a competitor has placed a better product on the market. Accounting therefore does not give a complete account of the happenings in a business or an accurate picture of the business' condition. It follows then that the reader of an accounting report should not expect to find therein all, or perhaps even the most important, facts about a business.

The advantage of expressing facts in monetary terms is that money provides a common denominator by means of which the heterogeneous facts about a business can be expressed in terms of numbers which can be added and subtracted. "Net profit," for example, is a single figure summing up the combined influence on the business of thousands, perhaps millions, of separate happenings of a widely varying character.

Although the common denominator principle is an essential one, and although money is probably the only practical denominator, the use of the dollar implies a homogeneity—a basic similarity between one dollar and another—that may not in fact exist. Thus, included in the calculation of the net profit figure referred to above there may be labor costs paid for in current dollars and part of the cost of a building which was purchased some years earlier when a dollar was worth perhaps twice as much as it is worth currently. The problems created by the fact that price levels change over the years will be discussed in Chapter 13.

2. The Business Entity

Accounts are kept for *business entities,* as distinguished from the *persons* who are associated with these entities. In recording facts in the accounts, the important question is: how do they affect the business?—not, how do they affect the persons who own, operate, or otherwise are associated with the business? When the owner takes cash out of his business, for example, the accounting records show that the *business* has less cash than previously, even though the real effect of this event on the *owner* himself may have been negligible; he may have taken cash from his business "pocket" and put it into his personal "pocket," but it remains his cash.

It is sometimes difficult to define the business entity for which a set of accounts is kept. Consider the case of a man and his wife who run a small retail store. A set of accounts is kept for the store as a separate business entity, and the events reflected in these accounts must be those of the *store;* the nonbusiness events that affect the couple must not be included in them. Clearly, this means that the family's expenses for food, clothing, shelter, and the like should be separated from the expenses of running the store. But suppose that the couple lives on the business premises. How much of the rent, the electric light bill, and the property taxes of these premises are properly part of the business and how much are personal expenses of the family? Questions like these make the distinction between the business entity and outside interests difficult to make precisely in practice.

In the case of a corporation, the distinction is often quite easily made. A corporation is a legal entity separate from the persons who own it, and the accounts of many corporations correspond exactly to the scope of the legal entity. There may be complications, however. In the case of a group of legally separate corporations that are related to one another by stockholdings, the whole group may be treated as a single business entity for certain purposes, giving rise to what are called "consolidated" accounting statements. Conversely, within a single corporation, a separate set of accounts may be maintained for each of the principal divisions of the corporation, especially when they are physically separated from the home office.

These differences in practice do not complicate matters in this introduction to accounting since in our introductory cases we shall be dealing only with situations where the definition of the business entity is reasonably clear.

3. Value Equals Cost

Valuable things (i.e., rights in tangible and intangible property) owned by a business are called, in accounting language, *assets.* A fundamental concept of accounting is that assets are ordinarily entered on the accounting records of the company at the price paid to acquire them.

Since, for a variety of reasons, the real worth of an item may change with the passage of time, the accounting valuation of assets does not necessarily—indeed, does not ordinarily—reflect what assets are worth, except at the moment they are acquired. There is therefore a considerable difference between the accounting concept of value and the everyday, nonaccounting concept of value, since in its ordinary usage "value" means what something is worth. If a business buys a plot of land, paying $5,000 for it, this asset would be recorded in the accounts of the business at a value of $5,000. Subsequent changes in the *real* value of this land would ordinarily not be reflected by changes in the accounts. If the land could be sold for $10,000 a year from now, or if it could be sold for only $2,000 a year from now, no changes would ordinarily be made in the accounting records to reflect this fact. (The word "ordinarily" is used since there are a few situations in which accounting records are changed to reflect changes in real value; these will be described subsequently.)

Thus, the amounts at which assets are listed in the accounts of a company do *not* indicate what the assets could be sold for. One of the most common mistakes made by uninformed persons reading accounting reports is that of believing that there is a close correspondence between the figure at which an asset appears on these reports and the real value of the asset. Of course, there may well be a correspondence between accounting valuation and real market values in the case of certain assets. The asset "cash" is the best example. Readily marketable securities and inventories held by the company for only a short period of time may appear on the books at a figure that is close to their real worth. In general, it is safe to say that the longer an asset has been owned by a company, the less likely it is that its value on the accounting records corresponds to its current market value.

The accounting concept of value does not mean that all assets remain on the accounting records at their original purchase price for as long as the company owns them. The accounting value of assets that have a long, but nevertheless limited, life is systematically reduced to zero over that life by the process called *depreciation.* This process will

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be discussed in more detail in Chapter 6. The purpose of the depreciation process is gradually to remove the *cost* of the asset from the records; depreciation has no necessary relationship to changes in market value or in the real worth of the asset to the company.

It follows from the accounting concept of value that if the company pays *nothing* for an item it acquires, this item will usually *not* appear on the accounting records as an asset. Thus, the knowledge and skill that is built up as the business operates, the teamwork that grows up within the organization, a favorable location that becomes of increasing importance as time goes on, a good reputation with its customers—none of these appears as assets in the accounts of the company.

On some accounting reports, you will see the term "goodwill"; and reasoning from the everyday definition of this word, you may conclude that it represents the accountant's appraisal of what the company's name and reputation are worth. This is not so. Goodwill appears in the accounts of the company only when the company has *purchased* some intangible and valuable property right. A common case is when one company buys another company and pays more than the fair value of the tangible assets owned by that company. The amount by which the purchase price exceeds the value of the assets is goodwill, representing the value of the name, the reputation, the location, or other intangible possessions of the purchased company. Unless the business has actually purchased such intangibles, however, no item for "goodwill" is shown in the accounts. If the item does appear, it is shown initially at the purchase price, even though the management may believe that its real value is considerably higher.

Rationale of This Principle. The student has been asked to accept the accounting principles described herein, whether or not he agrees with them; but he may find it especially difficult to accept the accounting concept of value. He may well ask: Why are accounting records based on what seems to be an artificial concept of value rather than on what the assets are really worth? An attempt to answer this question fully is outside the scope of this chapter since the student is here asked to *accept* principles rather than to challenge them. Nevertheless it may be helpful to mention two arguments in support of this principle.

The first has to do with the *going concern assumption,* which is another basic accounting concept. In accounting, it is ordinarily assumed that a business is a going concern whose life is *indefinitely long.* In accordance with this assumption, there would be no point in valuing assets such as buildings and machinery at what they could be sold for, since they never would be sold as a group unless the firm were going out of business, and this situation is assumed never to arise.

The second reason for valuing assets at their purchase price is that this is a more definite and certain basis than the alternative of attempting to estimate current market values. If the reader of accounting reports knows that the assets are valued at cost, he can make whatever adjustments to them he believes to be necessary in order to reflect current values, whereas if the basis of valuation were someone's estimate, the reader would be forced to accept that estimate.

There are more exceptions and qualifications to the concept "value equals cost" than there are to any of the other concepts here described. Some of these will be discussed subsequently.

4. The Dual-Aspect Principle

As stated above, the valuable things owned by a business are called "assets." The claims of various parties against these assets are called "equities." There are two kinds of equities: (1) *liabilities,* which are the claims of creditors, i.e., everyone other than the owners of the business; and (2) *owners' equity* (or "net worth," or "capital"), which is the claims of the owners of the business.[2] Since all of the assets of a business are claimed by someone (either by the owners or by some outside party) and since the total of these claims cannot exceed the amount of assets to be claimed, it follows that—

$$\text{Assets} = \text{Equities}$$

Accounting systems are set up in such a way that a record is made of *two aspects* of each event that affects these records, and in essence these aspects are changes in assets and changes in equities. Suppose that a man starts a business and that his first act is to open a bank account in which he deposits $10,000 of his own money. The dual aspect of this action is that the business now has an asset, cash, of $10,000, and the owner has a claim against this asset, also of $10,000, or—

$$\text{Assets (cash), \$10,000} = \text{Equities (owner's), \$10,000}$$

If the business then borrowed $5,000 from a bank, the accounting records would show an increase in cash, making the amount $15,000, and a new claim against this cash by the bank in the amount of $5,000. At this point the accounting records of the business would show:

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[2] Some accountants use the word "liabilities" to include both the claims of creditors and the claims of owners; when so used it is synonymous with the word "equities" as used here. In this introductory material it seems more convenient to use the narrower meaning.

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Cash	$15,000	Owed to bank	$ 5,000
		Owner's equity	10,000
Total Assets	$15,000	Total Equities	$15,000

It follows that every event that is recorded in the accounts affects at least two items; there is no conceivable way of making a single change in the accounts under the dual-aspect principle.

An accounting system conceivably could be set up with some principle other than the one stated here. As a matter of fact, there is a system called "single-entry" accounting that records only one aspect of a transaction, very much like the record maintained in a ship's log or a diary. There are many advantages, however, both mechanical and conceptual, in the dual-aspect principle, and this is so universally accepted that no further mention will be made of any other possibility.

5. *The Accrual Principle*

The accrual principle is mentioned here only to round out the list of basic principles. It will be described and discussed in Chapter 4.

FUNDAMENTAL CONVENTIONS

In practice, the foregoing principles are modified by certain conventions that accountants generally have adopted. Of these, the most important are: (1) consistency, (2) conservatism, and (3) materiality.

Consistency

The five principles just given are so broad that there are in practice several different ways in which a given event may be recorded in the accounts. For example, when a company takes a cash discount in paying bills to its vendors, this discount may be treated as being revenue to the company; it may be treated as a reduction in the purchase price of the goods purchased; or the cash discounts *not* taken may be treated as an expense. The doctrine of consistency requires that once a company has decided on one of these methods, it will treat all subsequent events of the same character in the same fashion. If a company made frequent changes in the manner of handling a given class of events in the accounting records, comparison of its accounting figures for one period with those of another period would be difficult.

Because of this doctrine, changes in the method of keeping accounts are not made lightly. A company's auditors invariably include in their certificate (i.e., a letter summarizing the results of their annual examination of accounting records) the statement that the figures were prepared "in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year"; or if there were changes in practice, these are spelled out in the certificate.

Conservatism

The doctrine of conservatism means that when the accountant has a reasonable choice, he ordinarily will show the lower of two asset values for a given item, or will record an event in such a way that owners' equity is lower than it otherwise would be. This doctrine is especially important as a modifier of the accounting concept of value. To illustrate, the value of a company's inventories (material held for sale, supplies, etc.) is ordinarily reported not at their cost, which is what one would expect in accordance with the general concept of value, but rather at the *lower* of their cost or their current market value.

The doctrine of conservatism is applied much less strongly now than was the case a few decades ago when it was a common practice to report some asset values at far less than either their cost or their current market value. Nevertheless, the doctrine still has an important influence on accounting. Many informed persons would say that this doctrine is illogical and that the accountant should attempt to report the figures either consistently on the basis of cost or consistently on the basis of market value rather than choosing the more conservative of these two possible approaches. Nevertheless, few would question the fact that the doctrine does exist and is important.

Materiality

In law, there is a doctrine called *de minimis non curat lex,* which means that the court will not consider trivial matters. Similarly, the accountant does not attempt to record a great many events which are so insignificant that the work of recording them is not justified by the value gained thereby. An example of these trivialities is the accounting treatment of pencils. A brand new pencil is an asset of the company. Every time a man writes with the pencil, part of this asset value is used up, and the owners' equity decreases correspondingly. Theoretically, it would be possible to ascertain daily the number of partly used pencils that are owned by the company and to correct the records so as to show the asset value that remains in them, but the cost of such an effort would obviously be gigantic, and no accountant would attempt to do this. He would take the simpler, even though less exact, course of action and consider that the asset value was used up at the time the pencils were purchased or at the time they were issued from inventory to the user.

There is no agreement as to the exact line separating material events from immaterial events. The decision depends on judgment and common sense. It is natural for the beginning student, who does not have an appreciation of the cost of collecting information in practice, to be more meticulous in recording events in the accounts than would the practicing accountant.

THE BALANCE SHEET

The balance sheet (or "position statement," or "statement of financial position") is the fundamental accounting report in the sense that every transaction can be recorded in terms of its effect on the balance sheet. It shows the status of the business as of a given moment of time, insofar as accounting figures can show its status. (A balance sheet dated "December 31" is implicitly understood to mean "at the close of business on December 31," and a balance sheet dated "January 1" means "at the beginning of business on January 1." These two balance sheets refer to the same moment of time.) A balance sheet for a hypothetical corporation is shown in Illustration 3–1.

Let us examine this statement in terms of the basic concepts listed above. The figures are *expressed in dollars* and reflect only those matters about a corporation that can be expressed in dollars. The *business entity* involved is the Garsden Corporation, and the balance sheet pertains to that entity rather than to any of the individuals associated with the company. The *asset values* reflected are governed by the accounting concept of value. The *dual-aspect* concept is evident from the fact that the assets listed on one side of this balance sheet are equal in total to the equities, or claims against the assets, listed on the other side.

Incidentally, the practice of listing assets on the left-hand side and equities on the right-hand side of the balance sheet is common in the United States, as is the alternative practice of listing assets at the top of the page with equities underneath them. In certain other countries, assets are listed on the right-hand side and equities on the left-hand side. As was stated above, the fact that the two sides add up to the same total necessarily follows from the dual-aspect principle; it does not tell anything about the company's financial condition. This equality of the two sides of the balance sheet is always found unless a clerical error has been made.

Although each individual asset or equity—each building, each piece of equipment, each customer who owed money, etc.,—could theoretically be listed separately on the balance sheet, it is obviously more

Illustration 3–1

GARSDEN CORPORATION

Balance Sheet as of December 31, 1955

ASSETS		
Current Assets:		
Cash	$ 3,448,891	
Accounts receivable (net)	5,943,588	
Inventories	12,869,633	
Prepaid expenses and deferred charges	388,960	
Total		$22,651,072
Fixed Assets:		
Land, buildings, and equipment	$26,945,848	
Less: Accumulated depreciation	13,534,069	13,411,779
Other Assets:		
Goodwill		63,214
Total Assets		$36,126,065

EQUITIES		
Current Liabilities:		
Accounts payable	$ 4,929,442	
Estimated income tax liability	6,344,000	
Accrued expenses	640,407	
Deferred income	205,240	
Total		$12,119,089
Other Liabilities:		
Mortgage bonds		3,000,000
Stockholders' Equity:		
Common stock	$15,000,000	
Retained earnings	6,006,976	21,006,976
Total Equities		$36,126,065

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practicable and more informative to group related items into categories or *account classifications.* There is no fixed pattern as to the number of such categories or the amount of detail reported; rather, the format is governed by the accountant's opinion as to the most informative way of presenting significant facts about the status of the business. The balance sheet in Illustration 3–1 gives a minimum amount of detail. The terms used on this balance sheet are common ones, and they are described briefly below.

Current Assets

The definition given by the American Institute of Accountants is a good one to follow:

> For accounting purposes, the term *current assets* is used to designate cash and other assets or resources commonly identified as those which are reasonably expected to be realized in cash or sold or consumed during the normal operating cycle of the business. Thus the term comprehends in general such resources as (a) cash available for current operations and items which are the equivalent of cash; (b) inventories of merchandise, raw materials, goods in process, finished goods, operating supplies, and ordinary maintenance material and parts; (c) trade accounts, notes, and acceptances receivable; (d) receivables from officers, employees, affiliates, and others, if collectible in the ordinary course of business within a year; (e) installment or deferred accounts and notes receivable if they conform generally to normal trade practices and terms within the business; (f) marketable securities representing the investment of cash available for current operations; and (g) prepaid expenses such as insurance, interest, rents, taxes, unused royalties, current paid advertising service not yet received, and operating supplies.[3]

The distinction between current assets and noncurrent assets is important since much attention is given by lenders and others to the total of current assets. As noted in the definition quoted above, the essence of the distinction is *time.* Current assets are those that will be owned only for a short period of time, usually not more than a year from the balance sheet date, whereas noncurrent assets are those that are expected to be owned for a longer period of time.

Although the usual time limit is one year, exceptions occur in companies whose normal operating cycle is longer than one year. Tobacco companies and distilleries, for example, include their inventories as current assets even though tobacco and liquor remain in inventory for an aging process that lasts two years or even longer.

In industrial and commercial companies, it is customary to list current assets ahead of other assets on the balance sheet; but in public utilities and in certain other types of companies, fixed assets are listed first. Usually current assets are listed in order of their liquidity starting with cash, the most liquid asset.

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[3] American Institute of Accountants, *Accounting Research Bulletin No. 43,* p. 20.

Cash consists of funds that are immediately available for disbursement without restriction. Usually, most of these funds are on deposit in checking accounts in banks, and the remainder is in cash registers or other temporary storage facilities on the company's premises.

Accounts receivable are amounts owed to the company, usually by its customers. Sometimes this item is broken down into *trade accounts receivable* and *other accounts receivable;* the former refers to amounts owed by customers, and the latter refers to amounts owed by persons other than customers. If the debt is evidenced by a note or some other written acknowledgment of the obligation, it would ordinarily appear under the heading *notes receivable* rather than accounts receivable. On the Garsden Corporation balance sheet, accounts receivable are reported "net." This means that the figure $5,943,588 is not the total amount owed by customers but is a smaller amount; the total amount owed has been reduced by an estimate of the amount of obligations that will not be paid.

As defined by the American Institute of Accountants Committee, the term *inventory* means "the aggregate of those items of tangible personal property which (1) are held for sale in the ordinary course of business, (2) are in process of production for such sale, or (3) are to be currently consumed in the production of goods or services to be available for sale."[4]

The item *prepaid expenses and deferred charges* represent certain assets, usually of an intangible nature, whose usefulness will expire in the near future. An example is an insurance policy. A business pays for insurance protection in advance, often for a three-year or a five-year period. Its right to this protection is an asset—a valuable thing owned by the company—but this right will expire within a fairly short period of time.

The distinction between "prepaid expenses" and "deferred charges" is not important. In some businesses, prepaid expenses and deferred charges are shown not as current assets but rather as "other assets" near the bottom of the balance sheet.

Fixed Assets

Fixed assets are tangible, relatively long-lived, items owned by the business. These assets are owned, ordinarily, because the business ex-

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[4] *Ibid.*, p. 27.

pects to use them in the production of other goods and services. If the assets are held for resale, they are classified as inventory, even though they are long-lived assets. In the balance sheet shown in Illustration 3–1 these assets are lumped together into the single item, "Land, buildings, and equipment," but in the balance sheets of many companies the figures for land, buildings, and various kinds of equipment are shown separately. In accordance with the accounting concept of value, the figure $26,945,848 on the Garsden Corporation balance sheet represents the cost of these assets to the company at the time they were purchased. The next item, "Accumulated depreciation," means that a fraction of the original cost amounting to $13,534,069 has been "written off the books." This process will be described in Chapter 6.

Other Assets

Other assets is a miscellaneous category that includes such items as permanent investments (as distinguished from temporary investments, which may be current assets) in the securities of other companies, in government securities, funds held for designated special purposes, and intangibles.

Intangible assets include goodwill (which was described briefly above), patents, copyrights, leases, licenses, franchises, and similar valuable, but nonphysical, things owned by the business. Items included in this category have a longer life span than items included in the current asset, prepaid expenses.

Liabilities

Liabilities are the claims of outsiders against the business or, to put it another way, the amounts that the business owes to persons other than the owners. It should be noted that all the liabilities shown on the balance sheet are claims against all the assets; ordinarily they are not claims against any *specific* asset or group of assets. Thus, accounts payable may arise through the purchase of material for inventory, but accounts payable are claims against all the assets, not merely against inventories.

Current Liabilities

Again, the definition recommended by the American Institute of Accountants is worth remembering:

> The term *current liabilities* is used principally to designate obligations whose liquidation is reasonably expected to require the use of existing resources properly classifiable as current assets, or the creation of other current liabilities. As

> a balance-sheet category, the classification is intended to include obligations for items which have entered into the operating cycle, such as payables incurred in the acquisition of materials and supplies to be used in the production of goods or in providing services to be offered for sale; collections received in advance of the delivery of goods or performance of services; and debts which arise from operations directly related to the operating cycle, such as accruals for wages, salaries, commissions, rentals, royalties, and income and other taxes. Other liabilities whose regular and ordinary liquidation is expected to occur within a relatively short period of time, usually 12 months, are also intended for inclusion, such as short-term debts arising from the acquisition of capital assets, serial maturities of long-term obligations, amounts required to be expended within one year under sinking fund provisions, and agency obligations arising from the collection or acceptance of cash or other assets for the account of third persons.[5]

Accounts payable represent the claims of vendors and others. Usually these claims are unsecured. If the claim was evidenced by a note or some other written acknowledgment of debt, the item would be called *notes payable, bank drafts payable,* or some other term that describes the nature of the obligation.

Estimated income tax liability is the amount owed the government for taxes. It is shown separately from other obligations both because of its size and because the amount owed is not precisely known as of the date of the balance sheet.

Accrued expenses are the converse of prepaid expenses. They represent certain obligations, which are indeed valid claims against the assets but which are "intangible" in the sense that they are not evidenced by an invoice or other document submitted by the person to whom the money is owed. An example is the wages and salaries owed to employees for work they have performed but for which they have not been reimbursed.

Deferred income represents the liability that arises because the company has received advance payment for a service it has agreed to render in the future. An example is prepaid rent, which represents rental payments received in advance for which the company agrees to permit the lessee to use a specified building (or other property) during some future period.

Other Liabilities

Other liabilities are claims of outsiders that do not fall due within one year. Evidently the mortgage bonds of the Garsden Corporation do not mature within the next year, nor do any fraction of them; otherwise all or part of this liability would appear as a current liability.

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[5] *Ibid.,* p. 21.

Owners' Equity

The *owners' equity* (also "capital," "net worth," or "proprietorship") section of the balance sheet shows the claims of the owners, in this case the stockholders. The terminology used in this section of the balance sheet varies with different forms of organization. In a corporation like the Garsden Corporation, the claims of the owners are evidenced by documents called *stock certificates.* The first item in the stockholders' equity section of the Garsden Company is the "stated value" of this stock. This may be the par value of the stock, or the price at which it was sold, or some other figure fixed by the board of directors. In the interest of consistency, once the basis of valuing each share of stock has been determined, it is rarely changed.

The item *retained earnings* is a balancing figure. It is the difference between the sum of the assets and the sum of the equities other than retained earnings. The owners' equity increases through *earnings* (i.e., the results of profitable operations) and decreases when earnings are paid out in the form of dividends. The difference between the total earnings and total withdrawals represents earnings retained for use in the business.[6]

The term *surplus* is often used instead of "retained earnings." The use of "surplus" for this item is apt to be misleading since to the uninitiated "surplus" represents something tangible, something "left over." There is, in fact, nothing tangible about this item. All the tangible things owned by the business appear on the assets side of the balance sheet. The word *surplus* is sometimes used with appropriate modifiers (capital surplus, paid-in surplus, etc.) for certain special items that will be described in Chapter 8.

In unincorporated businesses, different terminology is used in the owners' equity section. In a *proprietorship,* which is a business owned by one person, it is customary to show the owners' equity as a single figure, with a title such as "John Jones, Capital," rather than making a distinction between the initial investment of the owner and the accumulated earnings retained in the business.

In a *partnership,* which is an unincorporated business owned jointly by several persons, there is a capital account for each partner, thus:

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[6] Stockholders' equity is also affected by events other than the accumulation of earnings and the withdrawal of these earnings. Examples are the sale of stock at a premium or a discount, the revaluation of stock, and the creation of special reserves. Some of these events will be discussed in Chapter 8.

James Smith, capital	$15,432
John Smith, capital	15,432
Total Partners' Equity	$30,864

In addition to these basic owners' equity items, a proprietorship or a partnership may, for convenience, use a temporary item called a *drawing account* in which amounts withdrawn from the business by the owner(s) are recorded. Periodically, the total accumulated in the drawing account is subtracted from the capital item, leaving the net equity of the owner(s). For example, a balance sheet might show:

John Jones, capital	$25,000	
Less: Drawings	2,400	
Net proprietorship equity		$22,600

After the two items have been combined, the balance sheet would read simply:

John Jones, capital	$22,600

The student may have heard of the terms "partnership accounting" and "corporation accounting," and from these he may have formed the impression that different accounting systems are used for different forms of business organization. As a matter of fact, the treatment of assets and liabilities is generally the same in all forms of organization; differences occur principally in the owners' equity section as noted above.

BALANCE SHEET CHANGES

At the moment a business starts, its status can be recorded on a balance sheet. From that time on, events occur that change the figures on this beginning balance sheet, and the accountant records these changes in accordance with the principles given above. Full-fledged accounting systems provide a means of accumulating and summarizing these changes and of preparing new balance sheets at prescribed intervals.

In learning the accounting process, however, it is useful to consider the changes one by one. This makes it possible to study the effect of certain events without getting entangled with the mechanisms used in practice to record these events. The technical name given to an event that affects an accounting figure is a *transaction.* An example of the effect of a few transactions on the balance sheet will now be given.

1. John Smith starts a business, called Smith's Store, by depositing $10,000 of his own funds in a bank account which he has opened in the name of the store. The balance sheet of Smith's Store will then be as follows:

SMITH'S STORE

Balance Sheet as of ________

ASSETS		EQUITIES	
Cash	$10,000	John Smith, capital	$10,000

2. The business borrows $5,000 from a bank giving a note therefor. This transaction increases the asset cash, and the business incurs a liability to the bank. The balance sheet after this transaction will appear as follows:

SMITH'S STORE

Balance Sheet as of________

ASSETS		EQUITIES	
Cash	$15,000	Notes payable, bank	$ 5,000
		John Smith, capital	10,000
Total	$15,000	Total	$15,000

3. Smith buys inventory for his store in the amount of $2,000, paying cash. The balance sheet is as follows:

SMITH'S STORE

Balance Sheet as of________

ASSETS		EQUITIES	
Cash	$13,000	Notes payable, bank	$ 5,000
Inventory	2,000	John Smith, capital	10,000
Total	$15,000	Total	$15,000

4. The store sells for $300 cash, merchandise that cost $200. The effect of this transaction is that inventory has been decreased by $200, cash has been increased by $300, and John Smith's own equity has been increased by the difference, or $100. The $100 is the profit on this sale. The balance sheet will then look like this:

SMITH'S STORE

Balance Sheet as of________

ASSETS		EQUITIES	
Cash	$13,300	Notes payable, bank	$ 5,000
Inventory	1,800	John Smith, capital	10,100
Total	$15,100	Total	$15,100

These illustrations could be extended indefinitely. As we delve more deeply into the mechanics of accounting, it is worth remembering that every accounting transaction can be recorded in terms of its effect on the balance sheet.

AN ALTERNATIVE VIEW OF THE BALANCE SHEET

Up to this point we have been considering the balance sheet as a statement of assets and of claims against those assets. Another way of looking at the balance sheet that may be helpful in understanding it is described briefly below. This is not a description of a different concept but rather is an alternative method by describing the same document and the same figures as those discussed above and illustrated in Illustration 3–1.

The right-hand side of the balance sheet may be viewed as a description of the sources from which the business has obtained the capital with which it operates, and the left-hand side as a description of the form in which that capital is invested on a specified date. On the right-hand side of the balance sheet, the several liability items describe how much capital was obtained from trade creditors (accounts payable), from banks (notes payable), from bondholders (bonds payable), and other outside parties. The owners' equity section shows the capital supplied by the stockholders. If the business is a corporation, the stockholders' contribution consists of two principal parts: capital directly supplied (capital stock) and capital which the stockholders provided by permitting earnings to remain in the business (retained earnings).

Capital obtained from various sources has been invested according to the management's best judgment of the optimum mix, or combination, of assets for the business. A certain fraction is invested in buildings, another fraction in inventory, another fraction is retained as cash for current needs of the business, and so on. The asset side of the balance sheet therefore shows the result of this management judgment as of the date of the balance sheet.

When the balance sheet is viewed in this way, some of the apparent inconsistencies in accounting principles and definitions described above may be resolved. Considering assets as items in which capital has been invested makes it reasonable to record assets at their cost rather than at market value, for the cost basis shows the amount of capital tied up in each asset category. Furthermore, a description of retained earnings as one source of capital—the accumulated earnings of past periods not paid out as dividends—is probably easier to understand than a description of retained earnings as someone's "claim" against the business; it may be difficult to see how earnings can be a "claim" against anything.

In any event, either one of these approaches to the balance sheet is at best only a brief introduction to the balance sheet idea. Real com-

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prehension comes through constructing and using balance sheets in cases or practical business situations.

CASES

CASE 3–1. HENRY MERCER

After a slow start, Henry Mercer's business grew to the point where the simple records on which he had been relying for information became inadequate. He therefore sought help in devising and installing a set of accounting records that would provide the information he needed to manage his company.

Mr. Mercer got the idea for his business while he was serving as a pharmacists mate in the Navy. In his off-duty hours he liked to carry on experiments in the pharmaceutical laboratory on his ship, and although he had only a high school education in chemistry, he developed several chemical compounds that seemed to have commercial possibilities. Of these, the most promising seemed to him to be a liquid which, when sprayed into the air, tended to neutralize unpleasant odors.

After his discharge from the Navy, he obtained a job in a drugstore and continued his experiments in his spare time. In order to test the commercial potentiality of his spray, he bottled a small quantity under the trade name AirNu and attempted to find customers. Several competing products were on the market, and at first he had great difficulty in convincing anyone that AirNu was in any way superior to them. Some of his prospects, principally hospitals, jails, and other city and state institutions, agreed to try AirNu, however, and several of these trials resulted in sales. From this beginning business increased to the point where, two years after he left the Navy, Mr. Mercer gave up his job in the drugstore to devote full time to his venture, which he named the Mercer Chemical Company.

At first he carried on the business alone, with some assistance from his wife on the paperwork. Mrs. Mercer had studied bookkeeping in the local business college. The records consisted of a checkbook, a file of unpaid bills, another file of paid bills, and a memorandum record of sales to and amounts owed by customers. Funds of the Mercer Chemical Company were kept in a separate bank account, and each week Mrs. Mercer drew a check for $100 on this account and deposited it in the Mercer family account. The original capital of the business had been furnished by Mr. Mercer from savings accumulated during his Navy days. It totaled about $500.

At the end of another year, Mr. Mercer decided to hire a man part time to help with the manufacture of AirNu and also to hire a full-time salesman who would visit drugstores and supermarkets in an attempt to break into the consumer market.

The manufacture of AirNu was a simple process. Water was added to a prepared base of several commercially available ingredients, the mixture was shaken, and then bottled in either gallon or eight-ounce containers. A spray nozzle was inserted in the top of the container, and a label was pasted on. The eight-ounce containers were packed in cartons, each of which held six bottles. Cartons, bottles, labels, and spray nozzles were purchased as required. Operations were carried on in the basement of the Mercer home, although storage space there was becoming so crowded that Mr. Mercer thought he soon would have to move the business into its own quarters.

At about the time he decided to hire the new men, Mr. Mercer became concerned about the adequacy of his records. He talked the matter over one evening with Mr. James Finnerty, controller of a large chemical company, who was a friend of Mr. Mercer's father.

Mr. Finnerty listened to the story of the Mercer Chemical Company's birth and growth with considerable interest and with some surprise and then made the following observations:

> The favorable response of tough-minded industrial buyers to AirNu should be gratifying to you and indicates that your product has merit. A successful business requires more than a good product, however; it also requires good management. In order to manage the business, you need, among other things, records. The records for your business do not need to be as elaborate as those used in the large company I work for; in fact, I doubt that a study of our system would help you very much in setting up a system for the Mercer Chemical Company.
>
> The need for adequate records is particularly important in view of your recent decision to add people to your payroll. Furthermore, as your business grows, you probably will need to borrow money from the bank, and the bank will certainly want to study the facts about your progress and your status before granting you a loan. If, as you indicate, you plan to introduce other products, records showing cost and profit by products will become increasingly important. As a matter of fact, good figures on your experience with AirNu might turn up some valuable information that will help you make your company more profitable.

Questions

1. Describe, as completely as you can, the types of information that you think Mr. Mercer needs to have in order to manage his business.

2. How would you go about constructing a balance sheet for the Mercer Chemical Company? What items would probably be shown on such a balance sheet, and how would you obtain the dollar amount to put opposite each item?

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CASE 3–2. SMOKY VALLEY CAFE[7]

On August 12, 1946, three people, who had previously been employed to wait on tables in one of the cafes in Baxter, Oregon, formed a partnership. The eldest of the three was Mrs. Bevan, a middle-aged widow. The other two were Mr. and Mrs. Elmer Maywood. The partnership lasted for slightly more than four months, and in connection with its dissolution the preparation of a balance sheet became necessary.

Each of the partners contributed $2,000 cash, a total of $6,000. On August 12, the partnership purchased the Smoky Valley Cafe for $16,000. The purchase price included land valued at $2,500, improvements to land at $2,000, buildings at $10,500, and cafe equipment at $1,000. The partnership made a down payment of $4,500 (from its $6,000 cash) and signed a mortgage for the balance of the $16,000. The doors of the cafe were opened for business shortly after August 12.

One of the things that made this particular piece of property attractive to them was the fact that the building contained suitable living accommodations. One of these rooms was occupied by Mrs. Bevan, another by the Maywoods.

The Maywoods and Mrs. Bevan agreed on a division of duties and responsibilities which would allow them to keep the cafe open twenty-four hours a day. They agreed that Mrs. Bevan would operate the kitchen, Mrs. Maywood would have charge of the dining room, and that Mr. Maywood would attend the bar. Mrs. Bevan agreed to keep the accounting records. She was willing to perform this task because she was vitally interested in making the business a success. She had invested the proceeds from the sale of her modest home and from her husband's insurance policy in the venture. If it failed, the major part of her financial resources would be lost.

A beer license was granted by the state authorities. On August 15, the partnership sent a check for $35 to the distributor who supplied beer. This $35 constituted a deposit on bottles and kegs necessary for the operation of the bar and would be returned to the Smoky Valley Cafe after all bottles and kegs had been returned to the beer distributor.

The Smoky Valley Cafe was located on a major highway, and a great deal of business was obtained from truck drivers. One of these truck driver patrons, Fred Mead, became a frequent customer. He soon gained the friendship of Mrs. Maywood.

In October, the partners decided that to continue to offer their patrons quality food, they would have to add to their equipment. This new equipment cost $415.95, and because the supplier of the equipment was unimpressed with the firm's credit rating, the equipment was paid for in cash.

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[7] Based on a case argued before the Supreme Court of the State of Oregon, March 28, 1950. See 216 P2d 1005.

The month of November did not improve the cash position of the business. In fact, the cash balance became so low that Mrs. Bevan contributed additional cash in the amount of $400.00 to the business. She had hopes, however, that the future would prove to be more profitable.

On the night of December 12, Fred Mead stopped in the cafe to see Mrs. Maywood. Shortly after he left, Mrs. Maywood retired to her room. A few hours later, Mr. Maywood came in and asked for her, and after a brief search discovered that she had departed through a window. Her absence led him to the conclusion that she had departed with Fred Mead, and he thereupon set out in pursuit of the pair.

On December 16, Mrs. Bevan decided that the partnership was dissolved because she had not heard any word from either of the Maywoods. (The courts subsequently affirmed that the partnership was dissolved as of December 16, 1946.) Although she had no intention of ceasing operations, she realized that an accounting would have to be made as of December 16. She called in Mr. Bailey, a local accountant, for this purpose.

Mrs. Bevan told Mr. Bailey that they had been able to pay $700 on the mortgage while the partnership was operating. Cash on hand amounted to $65.35, but the bank balance was only $9.78. Mr. Bailey found bills owed by the cafe totaling $92.01. Mrs. Bevan said that her best estimate was that there was $100 worth of food on hand.

Mr. Bailey estimated that a reasonable allowance for depreciation on the fixed assets was as follows:

Asset	*Depreciation Allowance*
Land improvements	$ 44.45
Buildings	233.45
Cafe equipment	44.19

Questions

1. Draw up a balance sheet for the Smoky Valley Cafe as of August 12, 1946, taking into account the events described in the first two paragraphs of the case.

2. Draw up a balance sheet as of December 16, 1946.

3. What were the equities of the Maywoods and Mrs. Bevan, respectively? (In partnership law, the partners share equally in profits and losses unless there is a specific provision to the contrary. Each partner in the Smoky Valley Cafe, therefore, would have an equity in one third of the profits, or his equity would be decreased by one third of the losses.)

4. Do you suppose that the partners received these amounts? Why?

Chapter

4

THE ACCRUAL CONCEPT AND THE INCOME STATEMENT

One of the objectives of a business enterprise is to earn a profit. In the terminology developed in the preceding chapter, *profit* is the increase in the owners' equity that results from the operation of the business. Management is obviously very much interested in events that result in changes in owners' equity. The topics discussed in this chapter are: (1) the accrual concept, which governs the measurement of business profit; and (2) the income statement, which summarizes the items that determine profit over a specified period of time.

THE ACCRUAL CONCEPT

Changes in owners' equity must be either increases or decreases. Increases in owners' equity resulting from operations of the business are called *revenues,* and decreases are called *expenses.* The difference between revenues and expenses is called *net income* (or net profit, or net loss). This definition states the essence of the accrual concept; namely, that net income refers to changes in the owners' equity resulting from operations rather than to changes in the amount of cash the business has.

A person who is unfamiliar with accounting tends to think that revenue is the same as a cash receipt and expense the same as a cash disbursement. The error of this belief can easily be demonstrated by referring back to the balance sheets given on page 58, in which the effect of borrowing $5,000 from a bank was shown. This borrowing resulted in a cash receipt of $5,000, but there was no revenue; the increase in assets was exactly matched by an increase in the liability to the bank, and there was no change in owners' equity. Revenue results only when owners' equity is increased. Similarly, the purchase of merchandise for cash is not an expense, since the decrease in cash is exactly offset by a corresponding increase in inventory, and there is no change in owners' equity.

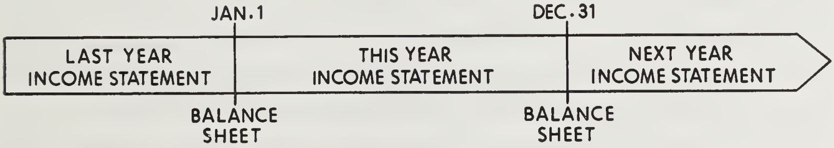
The Accounting Period

Considering the whole life of the business, net income is simply the excess of the amount the owners get out of the business over what they put into the business, an amount that can easily be determined. Management cannot wait, however, until the business has ended for information on how well the business is doing; such information is needed for much shorter intervals of time. Thus, accountants choose some convenient segment of time, such as a month, a year, or even a day or a week, and they attempt to collect, summarize, and report all the significant changes in owners' equity that have occurred during that time. The time interval chosen is called the *accounting period.*

Most businesses are living, continuing organisms, and the act of chopping the stream of business events into time periods is therefore somewhat arbitrary since business activities do not stop or change measurably as one accounting period ends and another begins. It is this fact that makes the problem of measuring expense and revenue in an accounting period the most difficult problem in accounting.

The diagram in Illustration 4–1 shows a portion of the life of a business that has been chopped into annual accounting periods.

Illustration 4–1


JAN. 1
DEC. 31
LAST YEAR INCOME STATEMENT
THIS YEAR INCOME STATEMENT
NEXT YEAR INCOME STATEMENT
BALANCE SHEET
BALANCE SHEET

For each of these accounting periods an income statement is prepared, and for each point between periods (i.e., January 1 and December 31) there is a balance sheet. In the next section, the measurement of expense and revenue in "this year" will be discussed.

Measurement of Expense

There is no exact agreement on the definition of the word "expense"; some of the synonyms often used are "sacrifices made," "services rendered," "resources consumed," or "benefits received" during an accounting period. The term "cost" is not synonymous with "expense." As just explained, "expense" means a decrease in owners' equity that arises from the operation of a business during a specified accounting period, whereas

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"cost" means any monetary sacrifice, including sacrifices that do not affect owners' equity during a given accounting period.

The American Accounting Association Committee gives the following definition:

> Expense is the cost of assets or portions thereof deducted from revenue in the measurement of income. These deductions arise through a current expenditure of cash, a total or partial expiration of asset cost, or the incurrence of a liability. Expense consists of operating costs—deductions that have a traceable association with the production of revenue, and losses—deductions that have no such association.[1]

Expenses and Expenditures. An *expenditure* takes place when an asset or service is acquired. The expenditure may be made by cash, by the exchange of other assets, or by incurring a liability. Over the entire life of a business *all* expenditures made by a business become expenses, and there are no expenses that are not represented by an expenditure. In any time segment *shorter* than the life of a business, however, there is no necessary correspondence between expense and expenditure.

Consider the example of the pencil mentioned in the preceding chapter. The purchase of pencils for cash is an *expenditure* which represents the exchange of one asset for another; there is no expense involved in this transaction. An expense is incurred in the accounting period in which the pencils are *consumed.* Or, take the case of the wages of a clerk in a retail store. These wages are earned—and the company is legally liable for them—in the accounting period in which the clerk works. The fact that the company may not actually pay the clerk his wages until a subsequent accounting period does not change the fact that the expense was incurred at the time the work was done.

The foregoing examples illustrate the three types of events that must be considered in distinguishing between expenses and expenditures. Referring to "this year" on the diagram in Illustration 4–1, these are:

1. Expenses of "this year."
2. Expenditures made prior to "this year" that become expenses "this year." On the January 1 balance sheet, these appear as assets.
3. Expenses of "this year" that will become expenditures in a subsequent year. On the December 31 balance sheet, these appear as liabilities.

Expenses of "This Year." The expenses of "this year" are the cost of the products sold during the year and other expenses incurred in the operation of the business during the year. These include the wages and salaries *earned* by employees during the year, whether or not they were paid; the supplies and other assets *consumed* during the year; telephone, electricity, and other services *used* during the year; and so on.

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[1] "Accounting Concepts and Standards Underlying Corporation Financial Statements," 1948 Revision, *The Accounting Review,* October, 1948, p. 341.

The American Accounting Association Committee describes the recognition of expenses as follows:

> Expense is given recognition in the period in which there is (a) a direct identification or association with the revenue of the period, as in the case of merchandise delivered to customers; (b) an indirect association with the revenue of the period, as in the case of office salaries or rent; or (c) a measurable expiration of asset costs even though not associated with the production of revenue for the current period, as in the case of losses from flood or fire.[2]

Assets That Will Become Expenses. On January 1, a company has certain assets. During "this year" some of these assets will be transformed into expenses. Three types of such assets are described below.

First, there are *inventories* of products; these become expenses when the products are sold.

Second, there are *prepaid expenses* and *deferred charges.* These represent services or other assets purchased prior to "this year," and they will become expenses in the year in which the services are used or the assets are consumed. *Insurance protection* is one example; the premiums on most types of insurance policies are paid in advance, and the amounts paid as premiums are assets until the accounting period in which the insurance protection is received, at which time they become expenses. If the company purchased a three-year insurance policy on December 31, 1955, for $900, the $900 would appear as an asset on the balance sheet of December 31, 1955, and $300 would appear on the income statement as an expense in the year 1956; the remaining $600 would appear as an asset on the balance sheet as of December 31, 1956, and so on. Another example is *rent.* If the company paid two years' rent in advance in December, 1955, this amount would appear as a prepaid expense on the balance sheet as of December 31, 1955, and half of it would appear as an expense in 1956, the first year in which the company received the benefit of the rented premises. Another, and somewhat different, example is *prepaid taxes.* Certain taxes are paid for in advance of the accounting period to which they apply, and although it is farfetched to say that this accounting period "benefits" from the taxes, it is consistent to charge these taxes as an expense in the accounting period, or periods, for which the tax is levied.

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[2] *Ibid.,* p. 341.

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The third category of assets that will become expenses is *long-lived* assets. Most fixed assets (with the exception of land) have a limited useful life. They are purchased with the expectation that they will be used in the operation of the business in future periods, and they become expenses in these future periods. The principle is exactly the same as that of the insurance policy previously mentioned, which also was purchased for the benefit of future accounting periods. An important difference between a fixed asset, such as a building, and an insurance policy is that the life of a building is usually difficult to estimate; the life of an insurance policy is known precisely. It follows that estimating the portion of a building's cost that is an expense in a given accounting period is a more difficult task than that of determining the insurance expense of a period. The mechanism used to convert the purchase price of fixed assets to expense is called "depreciation" and is described in Chapter 6.

Expenses Not Yet Paid. Some expenses which were incurred "this year" are not paid for by the end of the year. They must be paid in the future and are therefore liabilities of the company as of December 31. The liability for wages earned but not paid for is an example that has already been mentioned. There are several other types of obligations that have the same characteristic; namely, that although services were rendered in an accounting period prior to that for which the balance sheet is prepared, these services have not yet been paid for. The *incurrence* of these expenses reduces owners' equity; the subsequent *payment* of the obligation does not affect owners' equity.

For all obligations of this type, the transaction involved is essentially the same: the expense is shown in the period in which the services were used, and the obligation that results from these services is shown on the liability section of the balance sheet as of the end of the period. For example, if in 1955 an employee earned $50 that was not paid him, this is an expense (a decrease in owner's equity) of $50, and an increase in the liability, accrued wages, $50. In 1956, when this obligation is discharged, the effect is a decrease of $50 in accrued wages and a decrease of $50 in cash.

Measurement of Revenue

Usually, the *revenue* that is applicable to a given time period is relatively easy to ascertain. It consists primarily of the value of *sales* of products or services to customers. In the case of a tangible product, revenue is usually considered as earned in the accounting period in which title to the product passes from the company to the customer. There are many borderline cases (indeed, whole books have been written on the subject), but the date the product is shipped or the date shown on the invoice to the customer, whichever is later, is a satisfactory guide for most situations.[3] In the case of cash sales, of course, the revenue is earned on the date the sale is made and the cash received.

A business may work for several years on a single product, such as the construction of a large ship. In such cases, the business may consider that part of the money that will eventually be derived from the sale of the product is revenue of periods during which the product was being constructed, even though title of the product will not pass until some future period. Details of the procedures used in such situations may be found in advanced accounting texts or handbooks.

As was the case with expenses and expenditures, a careful distinction must be made between revenue and cash receipts. Referring back to our illustrative diagram, the balance sheet for January 1 may show, as liabilities, some items that become revenue in "this year." These are called *deferred income* or *prepaid income.* They represent the liability to render a service in some future period, payment having been made in advance. The owner of a building who receives rent in advance, the insurance company which receives insurance premiums in advance, and the magazine publisher who receives subscription income in advance will have such liabilities on their books.

At the other extreme, revenue may be earned "this year" even though payment is not received until "next year." The balance sheet as of December 31 will therefore show the asset "accounts receivable" representing amounts owed the business on account of sales made for which payment has not yet been received.

It is well to emphasize again the difference between the sales revenue in an accounting period and cash receipts from customers. Sales *revenue* consists of the amount of cash sales plus the amount of credit sales made to customers during the accounting period. Cash *receipts* arise from the cash received from cash sales and payments made by customers for amounts they owe the company (as well as from other sources). In a given accounting period, therefore, cash receipts from sales would equal sales revenue only: (1) if the company made sales only for cash, or (2) if the amount of cash collected from credit customers in an accounting period happened to equal the amount of credit sales made during that period.

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[3] Shipments on *consignment* are an important exception. The seller retains title to consignment merchandise, and the sale is not consummated until the consignee resells to a third party.

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A Reminder: The Dual-Aspect Concept

Each of the statements and examples given in the foregoing discussion is consistent with the dual-aspect concept. Going back to the pencil example on page 66, the purchase of pencils for cash is reflected on the balance sheet by a decrease in the asset cash and a corresponding increase in the asset supplies inventory. The consumption of pencils is represented by a decrease in the asset supplies inventory and an equal decrease in owners' equity. Every other situation described in this chapter can be described in terms of its dual effect on balance sheet items, so that at all times the basic equation, Assets = Equities, is preserved. Expense and revenue items represent no more than decreases and increases in owners' equity. For purposes of management analysis, it is important to collect and report these items in some detail, but insofar as their effect on the balance sheet goes, they can all be expressed directly in terms of their effect on owners' equity.

Another Reminder: Materiality

The doctrine of *materiality* is important in the process of determining the expenses and revenue for a given accounting period. Many of the expense and revenue items that are recorded for a given accounting period are necessarily estimates, and in some cases they are not very close estimates. There is a point beyond which it not worth while to attempt to refine these estimates. Telephone expense is a familiar example. The telephone bill is not received until well into the month following the period in which the telephone service was rendered. Thus, unless the business keeps records of the calls *made* during the month, it does not know the real telephone expense of the month. Nevertheless, a great many companies consider the telephone bill as an expense of the month in which the bill is received, on the grounds that a system that would ascertain the real expense would not be justified by the accuracy gained. Since in many businesses the amount of the bill is likely to be relatively stable from one month to another, no significant error may be involved in this practice.

Tax Accounting versus Business Accounting

It is reasonable for the uninitiated to believe that the process of determining net income for income tax purposes is the same as the process of determining net income for business purposes. This belief is almost, but not quite, correct. There are important differences between the rules that a company must follow in figuring its income tax and the rules that it should use in keeping its business records, and it is therefore dangerous to attempt to solve business accounting problems on the basis of income tax regulations. As a practical matter, a great many businesses choose to pattern their own accounting practices after the regulations that they must follow for tax purposes. This policy is convenient in that it reduces somewhat the number of separate records that must be maintained. Nevertheless, if this policy is carried to the point of complete subservience to the tax regulations, serious distortions in accounting reports can result.

THE INCOME STATEMENT

The accounting report that summarizes the revenue items, expense items, and the difference between them (net income) for an accounting period is called the *income statement* (or the "profit and loss statement," "statement of earnings," or "statement of operations"). In a sense the income statement is subsidiary to the balance sheet since the income statement shows in some detail the items that together account for the change in one balance sheet item, retained earnings, over an accounting period. This does not mean that the income statement is less important than the balance sheet, however; information shown on the income statement is fully as valuable to management as balance sheet information, if not more so.

Like any accounting report, the income statement should be prepared in a form that is most useful to those who read it. No specific format is prescribed. The following categories are found, in the order given, on many income statements of merchandising companies:

1. *Sales* (may be shown as gross sales less discounts, returns, or other subtractions, to give net sales).
2. *Cost of sales* (or "cost of goods sold"), as described in more detail below.
3. *Gross profit,* the difference between sales and cost of sales.
4. *Operating expenses,* which are frequently broken down into selling expenses, administrative expenses, and general expenses, with the significant items of expense reported separately under each category.
5. *Operating profit,* the difference between gross profit and operating expenses.
6. *Nonoperating revenue* (or "other revenue"), including interest, rent, and the like (unless the company's principal business is loaning money or renting property).
7. *Nonoperating expenses,* including financial costs, certain write-offs, and other charges not directly related to the conduct of the principal activity of the business during the accounting period.
8. *Profit before income tax,* Item 5, plus Item 6, less Item 7.

9. *Provision for income taxes.*
10. *Net income* (or net profit, or net loss), Item 8, less Item 9.

A condensed income statement is shown in Illustration 4–2, but no "model" income statement is given because of the wide variations in practice. Instead of the format outlined above, some companies use a *single-step* income statement. This format shows sales and other revenue as the first item, followed by a list of all expenses one after the other; the total of these expenses is subtracted from revenue to give net income.

SOME SPECIAL PROBLEMS

Three of the problems that often cause difficulties in the preparation of income statements are discussed below. The solution of these problems involves no new conceptions but only an application of the concepts discussed up to this point.

Cost of Goods Sold

One of the important items that decreases owners' equity in an accounting period in most businesses is the cost of the merchandise sold during the period. At the exact moment that owners' equity is increased by the sales value of a product sold, it is also decreased by the cost of that product. Indeed, were it not for the fact that the separate figures for sales revenue and cost of products sold are useful to management, it would be appropriate to record only the net increase in owners' equity that results from a sale, which is the gross profit—the difference between cost and selling price.

The determination of cost of sales in a manufacturing business involves special problems that are discussed in Chapter 7. The following relates to the determination of cost of sales in a merchandising business; that is, a business primarily engaged in buying and selling products, without altering their physical form.

Some businesses, especially those that sell high unit value merchandise in small quantities (such as automobile dealers), keep a record of the cost of each individual item sold. In these businesses, the total cost of the goods sold in an accounting period can be determined simply by adding up the costs recorded for the individual transactions.

Most businesses, however, do not have a means of keeping track of the cost of each item sold. In these businesses, the cost of goods sold is usually determined by the process of *deduction.* This process requires

Illustration 4–2

A "PACKAGE" OF ACCOUNTING REPORTS

Balance Sheet
As of December 31, 1954

ASSETS	
Current assets	$20,846,225
Fixed assets	14,256,720
Other assets	63,214
Total Assets	$35,166,159
EQUITIES	
Current liabilities	$12,891,570
Other liabilities	3,000,000
Common stock	15,000,000
Retained earnings	4,274,589
Total Equities	$35,166,159

Income Statement
For the Year 1955

Net sales	$75,478,221
Less: Cost of sales	52,227,004
Gross profit	$23,251,217
Less: Operating expenses	10,784,830
Operating profit	$12,466,387
Provision for income taxes	6,344,000
Net Income	$ 6,122,387

Retained Earnings Reconciliation Statement

Retained earnings, 12/31/54	$ 4,274,589
Add: Net income, 1955	6,122,387
	$10,396,976
Less: Dividends	4,390,000
Retained Earnings, 12/31/55	$ 6,006,976

Balance Sheet
As of December 31, 1955

ASSETS	
Current assets	$22,651,072
Fixed assets	13,411,779
Other assets	63,214
Total Assets	$36,126,065
EQUITIES	
Current liabilities	$12,119,089
Other liabilities	3,000,000
Common stock	15,000,000
Retained earnings	6,006,976
Total Equities	$36,126,065

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that a physical inventory, or count, be taken of the merchandise on hand and available for sale at the beginning of each accounting period and another at the end of the period. (The cost of merchandise on hand at the end of one period is of course identical with the figure for the beginning of the next period.) The dollar value of these inventories appears as an asset on the appropriate balance sheets.

Having determined the value of inventory, the cost of goods sold during a period is determined by the following reasoning process: The total amount of inventory available for sale during a period is what was on hand at the beginning of the period plus what was added (through purchasing additional merchandise) during the period; the difference between the total amount available for sale and the amount remaining at the end of the period is assumed to have been sold. Thus:

Beginning inventory	$ 400
Plus: Purchases	700
Equals: Goods available for sale	$1,100
Less: Ending inventory	200
Cost of Goods Sold	$ 900

This calculation appears on many income statements. If inward freight is added to the cost of merchandise, if some of the purchases were returned, or if purchase allowances were received, the "purchases" figure may be adjusted to reflect these facts. For example,

Beginning inventory		$ 400
Plus: Purchases, gross	$700	
Plus: Freight-in	60	
	$760	
Less: Purchase returns	20	
Net purchases		740
Goods available for sale		$1,140
Less: Ending inventory		200
Cost of Goods Sold		$ 940

Note that the validity of the reasoning behind the calculations described above rests on the *assumption* that if the merchandise is not found to be on hand at the end of the period, it must have been sold. This assumption is not necessarily correct; for some of the goods may have been lost, or stolen, or thrown away, or overlooked when the physical inventory was taken. Usually, but not always, safeguards are set up to detect or avoid most of the shrinkages resulting from the above causes. Even with such safeguards, however, there is no guarantee that the "cost of goods sold" figure found by the deduction method exactly represents the cost of merchandise actually billed to customers.

Wages and Salaries

The effect on the accounting records of earning and paying wages and salaries is more complicated than merely increasing expenses and decreasing cash, for when wages and salaries are earned or paid, certain other transactions occur almost automatically. The gross amount of wages and salaries earned is an expense. The employee is never paid this amount, however. There must be deducted from his gross wages:

1. An amount representing his contribution to the Old Age and Survivors' Insurance tax, which currently (1956) is 2 per cent of the first $4,200 of wages earned each year.
2. The withholding deduction, which is an amount withheld from gross earnings to apply toward the employee's income tax.
3. Deductions for pension contributions, savings plans, health insurance, union dues, and/or a variety of other items.

None of these deductions represent an expense to the business. In the case of the tax deductions, the business is acting as a collection agent for the government, and the withholding of these amounts and their subsequent transfer to the government does not affect the owners' equity. Similarly, the business is acting as a collection agent in the case of the other deductions. The employee is paid the net amount after these deductions have been taken.

When wages are earned, other expenses are automatically created. The employer must pay a tax equal in amount to the employee's OASI tax, and the employer must pay an additional percentage of the employee's pay (the rate varies in different states) for the *unemployment insurance tax.* (Collectively, old age and survivors' insurance and unemployment insurance are called *social security taxes.*) The *employer's* contribution for these taxes *is* an expense of the business.

Thus, if an employee with one dependent earns $60 for his work in a given week, there would be deducted from his pay $1.20 for his OASI tax contribution and $8.70 for withholding tax, and he would receive the balance, $50.10. (Other possible deductions are omitted for purposes of simplification.) The *company* would incur an expense of $1.20 for OASI tax and an additional expense of, say, $1.80, for the unemployment insurance tax, or a total of $3.00 for the two social security taxes.

The following transactions would result:

1. *Recognizing the wage expense and related liabilities:*

a) Increase in wage expense	$ 60	
b) Increase in wage liability (accrued wages)		$50.10
c) Increase in social security tax liability		1.20
d) Increase in withholding tax liability		8.70
		$60.00

2. *Recognizing the business tax expense and related liability:*

a) Increase in social security tax expense ($1.20 + $1.80)	$3.00	
b) Increase in social security tax liability		$3.00

3. *When the employee is paid:*

a) Decrease in wage liability	$50.10	
b) Decrease in cash		$50.10

4. *When the government is paid:*

a) Decrease in social security tax liability	$ 4.20	
b) Decrease in withholding tax liability	8.70	
c) Decrease in cash		$12.90

(Actually, of course, the remittance to the government would be for the total of amounts withheld from *all* employees, not merely the one individual shown here.)

The above transactions are recorded in accordance with the principles and definitions already stated, and the student may find that tracing the reasoning behind each of them provides a good review of the dual-aspect and accrual concepts. For reasons that will be explained in the next chapter, dollar amounts have been listed in two columns. Decreases in equities have been listed in the left-hand column, and increases in equities together with decreases in assets have been listed in the right-hand column.

Continuous Transactions

Some events that result in expenses are actually occurring more or less continuously as the business operates. Consider, for example, a pile of coal which was purchased for $1,000. On the day on which it was acquired, the $1,000 of coal was an asset, but each day thereafter some of it is shoveled into the furnace, whereupon part of the $1,000 becomes an expense. At the end of the accounting period, some of the coal may still remain on hand, and this portion is of course an asset. How should these transactions be recorded in the accounting records?

Two treatments are possible. The coal can be recorded as an asset, in the amount of $1,000, at the time it is received; and at the end of the period the asset item can be adjusted by subtracting out the cost of the coal consumed, leaving as an asset the value of the coal still on hand at the end of the period. Alternatively, the $1,000 can be initially recorded as if it were all an expense of the period; and at the end of the period the expense item can be adjusted by subtracting out the cost of the coal not yet consumed and setting this amount up as an asset.

Thus, although the *consumption* of coal is occurring continuously, it is convenient to *recognize* the expense (i.e., show it on the accounting records) only once each accounting period. Either of these two methods of giving accounting recognition to the events will produce exactly the same results, and the choice between them depends entirely on which is the more convenient. In other words, either method is in accordance with accounting principles. Insurance, interest, rent, and supplies are other examples of continuous transactions.

OTHER CHANGES IN OWNERS' EQUITY

Not all changes in owners' equity can be classified as revenue or expense, since these two terms refer only to increases and decreases that arise *through operations* in a *given accounting period.* Increases in owners' equity resulting from the contribution of capital by the owners, and decreases resulting from withdrawal of profits (i.e., dividends), have already been mentioned. There are a number of additional transactions that affect owners' equity.

Perhaps the most common of these is the transaction required to correct an error made in a *prior* accounting period. Suppose that in 1956 a company receives a bill for services performed for it by a lawyer in 1955, but these services had been overlooked when the 1955 financial statement was prepared. These services are not properly an expense of 1956, and the logical procedure, therefore, is to make the deduction in owners' equity directly rather than to report it on the income statement for 1956 as an expense of that year. This procedure is followed by many companies. Many other companies, however, follow the doctrine of the "clean surplus," or the "all-inclusive income statement," and report *all* (or almost all) increases and decreases in owners' equity, other than dividend payments and changes in capital structure, on the current year's income statement.

Excerpts from the American Institute of Accountants Committee statement on this subject follows:

> The question of what constitutes the most practically useful concept of income for the year is one on which there is much difference of opinion. On the

one hand, net income is defined according to a strict proprietary concept by which it is presumed to be determined by the inclusion of all items affecting the net increase in proprietorship during the period except dividend distributions and capital transactions. The form of presentation which gives effect to this broad concept of net income has some times been designated the *all-inclusive* income statement. On the other hand, a different concept places its principal emphasis upon relationship of items to the operations, and to the year, excluding from the determination of net income any material, extraordinary items which are not so related or which, if included, would impair the significance of net income so that misleading inferences might be drawn therefrom. This latter concept would require the income statement to be designed on what might be called a *current operating performance* basis, because its chief purpose is to aid those primarily interested in what a company was able to earn under the operating conditions of the period covered by the statement.[4]

. . . it is the opinion of the committee that there should be a general presumption that all items of profit and loss recognized during the period are to be used in determining the figure reported as net income. The only possible exception to this presumption relates to items which in the aggregate are material in relation to the company's net income and are clearly not identifiable with or do not result from the usual or typical business operations of the period. Thus, only extraordinary items such as the following may be excluded from the determination of net income for the year, and they should be excluded when their inclusion would impair the significance of net income so that misleading inferences might be drawn therefrom:

(a) Material charges or credits (other than ordinary adjustments of a recurring nature) specifically related to operations of prior years and adjustments of income taxes for prior years;

(b) Material charges or credits resulting from unusual sales of assets not acquired for resale and not of the type in which the company usually deals;

(c) Material losses of a type not usually insured against, such as those resulting from wars, riots, earthquakes, and similar calamities or catastrophes except where such losses are a recurrent hazard of the business;

(d) The write-off of a material amount of intangibles;

(e) The write-off of material amounts of unamortized bond discount or premium and bond issue expenses at the time of the retirement or refunding of the debt before maturity.[5]

Retained Earnings Reconciliation Statement

Sometimes, all changes in the retained earnings item are reported in what is called a "retained earnings reconciliation statement" (also called "surplus reconciliation statement"). This statement shows the balance of the retained earnings item at the beginning of an accounting period; the changes that have occurred during the period on account of net income, dividends, and the items listed above; and the balance at the end of a period. Such a statement links the income statement to the balance sheet. It is often shown at the bottom of an income statement.

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[4] American Institute of Accountants, *Accounting Research Bulletin No. 43,* p. 60.

[5] *Ibid.,* p. 63.

SUMMARY

There have now been described the two principal accounting reports, the balance sheet and the income statement. A moment's reflection will show that these reports can be combined into a package that discloses important information about the events of an accounting period. Such a package would consist of (1) a balance sheet as of the beginning of the period, (2) an income statement for the period, and (3) a balance sheet as of the end of the period. In addition, a retained earnings reconciliation is often used to show changes in retained earnings that are not reflected on the income statement. A much condensed version of such a package, presented so as to show the relationships among the various components, is shown in Illustration 4–2.

CASES

CASE 4–1. ELMER KUPPER

In 1954, Elmer Kupper opened his own retail store. At the end of 1955, his first full year of operation, he thought he had done moderately well, and he was therefore somewhat chagrined when the trade association to which he belonged sent him figures which indicated that he had operated at a loss.

Mr. Kupper had been employed as manager of the local unit of a chain store for several years. In 1954 he had received an inheritance, and this, together with his savings, provided him with enough funds to buy a small store building on the main street of his town for $30,000, in which he opened his store.

He joined the trade association to which several thousand independent retailers in the same line of business belonged. One of the services furnished by this association was the annual compilation of typical operating figures of member firms. These figures were prepared by Hartje & Mees, a large public accounting firm. Early in 1956, Hartje & Mees sent Mr. Kupper a standard form and requested that he report his revenue and expenses on this form and return it so that his figures could be averaged in with those of other member stores. Exhibit 1 shows the figures which, with some difficulty, Mr. Kupper entered on this form.

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Exhibit 1

ELMER KUPPER

Income Statement for 1955, as Prepared by Mr. Kupper

Gross sales		$65,927
Less: Returns and allowances to customers		2,426
Net sales		$63,501
Cost of merchandise sold		43,086
Gross margin		$20,415
Salaries and wages	$7,232	
Advertising	1,182	
Supplies and postage	793	
Taxes, insurance, repairs, and depreciation on building	1,347	
Heat, light, and power	426	
Business and social security taxes	992	
Insurance	472	
Depreciation on equipment	375	
Interest expense	240	
Miscellaneous expense	1,827	
Income taxes	1,220	
Total Expense		16,106
Net Profit		$ 4,309

Subsequently, he received a request from Hartje & Mees for information on his salary and on the rental value of his building, Mr. Kupper answered substantially as follows:

> I own my own business, so there is no point in my charging myself a salary. I drew $6,000 in profits from the business in 1955 for my personal use. My annual salary as manager of a Mogell store in recent years was $5,000, although I don't see what bearing this has on the figures for my own store.
>
> I thought I made it clear in my original submission that I own my own building. It would cost me $3,500 a year to rent a similar building, and you can see from the figures that I save a considerable amount of money by not being forced to rent.

On the basis of the information in this letter, Hartje & Mees revised Mr. Kupper's figures and sent him the income statement shown in Exhibit 2. Mr. Kupper was considerably incensed by this revised statement. He showed it to a friend and said:

> These fancy accountants have gotten my figures all mixed up. I want to know the profit I have made by operating my own business rather than by working for somebody else. They have turned my profit into a loss by calling part of it salary and part of it rent. This is merely shifting money from one pocket to another. On the other hand, they won't even let me show my income tax as an expense. I realize that the tax is levied on me as an individual rather than on the business as such, but my only source of income is my store, and I therefore think the tax is a legitimate expense of my store.

Exhibit 2

ELMER KUPPER

Income Statement for 1955, as Revised by Hartje & Mees

Gross sales		$65,927
Less: Returns and allowances to customers		2,426
Net sales		$63,501
Cost of merchandise sold		43,086
Gross margin		$20,415
Salaries and wages	$12,232	
Advertising	1,182	
Supplies and postage	793	
Rent	3,500	
Heat, light, and power	426	
Business and social security taxes	992	
Insurance	472	
Depreciation on equipment	375	
Interest expense	240	
Miscellaneous expense	1,827	
Total Expense		22,039
Net Loss		$ 1,624

Questions

1. How much profit did Mr. Kupper's store earn in 1955? How do you explain the difference between the profit shown on Exhibit 1 and the loss shown on Exhibit 2? What, if any, accounting principles are violated on either statement?

2. Should Mr. Kupper continue to operate his own store? Has he been successful?

3. Does the income statement that would be most useful to Mr. Kupper differ from the income statement that would be most useful in compiling average figures for use by the trade association membership?

CASE 4–2. JAMES STANTON

James Stanton took his wartime savings, some money his mother had left him, some material he found in his father's garage, and started business for himself. It wasn't a large business, but it did give him the pleasure of being his own boss and combined the inside work of manufacturing with the outside work of selling. His product was a painted wooden toy tank that was priced at retail at $14.50 each. It was a realistic toy, well designed, and intended for boys aged six to ten years. Mr. Stanton was an energetic person, and he soon had output rolling. This had been accomplished despite difficulties, chiefly with paint, but at last Mr. Stanton had found a supplier who promised to provide him with paint of the desired quality.

At the end of the first six months' experience, James Stanton took pride in his first profit and loss statement. He hoped it would be the forerunner of a long series of reports showing operations "in the black." This statement was as shown in Exhibit 1.

Exhibit 1

JAMES STANTON

Income Statement for Six Months Ending December 31, 1946

Net sales			$ 8,300.35
Beginning inventory, July 1, 1946		$ 150.00	
Purchases of material	$5,005.00		
Labor	8,105.45		
Rent of machines and space	2,090.10	15,200.55	
		$15,350.55	
Less: Inventory, December 31, 1946		11,490.50	
Cost of goods sold			3,860.05
Gross profit			$ 4,440.30
Advertising and other selling expenses		$ 1,510.23	
Interest		52.50	1,562.73
Net Profit			$ 2,877.57

Mr. Stanton's "balance sheet" as of December 31, 1946, appeared as follows:

Assets:		
Cash	$ 305.90	
Inventory, at cost	11,490.50	$11,796.40
Less: Liabilities:		
Note payable, L. K. Stanton	$ 3,000.00	
Accounts payable	2,739.50	5,739.50
Leaving James Stanton's net worth as		$ 6,056.90

Question

1. As best you can measure them, what were James Stanton's accomplishments and what were his prospects?

CASE 4–3. JOHN BARTLETT

John Bartlett was the inventor of a hose-clamp for automobile hose connections. Having confidence in its commercial value, but possessing no excess funds of his own, he sought among his friends and acquaintances for the necessary capital to put the hose-clamp on the market. The proposition which he placed before possible associates was that a corporation, Bartlett Manufacturing Company, should be formed with capital stock of $30,000 par value.

The project looked attractive to a number of the individuals to whom the inventor presented it, but the most promising among them—a retired manufacturer—said he would be unwilling to invest his capital without knowing what uses were intended for the cash to be received from the proposed sale of stock. He suggested that the inventor determine the probable costs of experimentation and of special machinery, and prepare for him a statement of the estimated assets and liabilities of the proposed company when ready to begin actual operation. He also asked for a statement of the estimated transactions for the first year of operations, to be based on studies the inventor had made of probable markets and costs of labor and materials. This information Mr. Bartlett consented to supply to the best of his ability.

After consulting the engineer who had aided him in constructing his patent models, Mr. Bartlett drew up the following list of data relating to the transactions of the proposed corporation during its period of organization and development:

1. The retired manufacturer would pay the corporation $10,000 cash for which he would receive stock with a par value of $14,000. The remaining stock (par value $16,000) would be given to Mr. Bartlett in exchange for the patent on the hose-clamp.
2. Probable cost of incorporation and organization, including estimated officers' salaries during developmental period: $825.
3. Probable cost of developing special machinery: $5,000. This sum includes the cost of expert services, materials, rent of a small shop, and the cost of power, light, and miscellaneous expenditures.
4. Probable cost of raw materials: $500, of which $300 is to be used in experimental production.

On the basis of the above information, Mr. Bartlett prepared the estimated balance sheet shown in Exhibit 1.

Exhibit 1

BARTLETT MANUFACTURING COMPANY

Estimated Balance Sheet as of Date Company Begins Operations

ASSETS		EQUITIES	
Cash	$ 3,675	Capital stock, par value	$30,000
Inventory	200	Less: Discount	4,000
Machinery	5,000	Stockholders' equity	$26,000
Organization costs	825		
Experimental costs	300		
Patent	16,000		
Total Assets	$26,000	Total Equities	$26,000

Mr. Bartlett then set down the following estimates as a beginning step in furnishing the rest of the information desired:

1. Expected sales, all to be received in cash by the end of the first year of operation: $28,000.
2. Expected additional purchases of raw materials and supplies during the course of this operating year, all paid for in cash by end of year: $9,000.

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3. Expected borrowing from the bank during year but loans to be repaid before close of year: $2,000. Interest on these loans: $50.
4. Expected payroll and other cash expenses and manufacturing costs for the operating year: $11,000 of manufacturing costs plus $3,000 for selling and administrative expenses, a total of $14,000.
5. New machinery and equipment to be purchased for cash: $1,000.
6. Expected inventory of raw materials and supplies at close of period, at cost: $1,800.
7. No inventory of unsold hose-clamps expected as of the end of the period. All products to be manufactured on the basis of firm orders received; none to be produced for inventory.
8. All experimental and organization costs, previously capitalized, to be charged against income of the operating year.
9. Estimated depreciation of machinery: $600.
10. Dividends paid in cash: $3,000.

It should be noted that the transactions summarized above would not necessarily take place in the sequence indicated. In practice, a considerable number of separate events, or transactions, would occur throughout the year, and many of them were dependent on one another. For example, operations were begun with an initial cash balance and inventory of raw materials, products were manufactured, and sales of these products provided funds for financing subsequent operations. Then, in turn, sales of the product subsequently manufactured yielded more funds.

Questions

1. Trace the effect on the balance sheet of each of the projected events appearing in Mr. Bartlett's list. Thus, Item 1, taken alone, would mean that cash would be increased by $28,000 and that (subject to reductions for various costs covered in later items) stockholders' equity would be increased by $28,000. Notice that in this question we are considering all items in terms of their effect on the balance sheet.

2. Prepare an income statement covering the first year of planned operations and a balance sheet as of the end of that year.

3. Referring to Exhibit 1, should the patent have been shown with a value of $16,000? Should the stockholders' equity have been shown at an amount of $26,000?

4. *Assume* that the management is interested in what the results would be if no products were sold during the first year, even though production continued at the level indicated in the original plans. The following charges would be made in the 10 items listed above: Items 1, 6, 7, and 10 are to be disregarded. Instead of Item 3, assume that a loan of $29,000 is obtained, that the loan is not repaid, but that interest thereon of $1,050 is paid during the year. Prepare an income statement for the year and a balance sheet as of the year. Contrast these financial statements with those prepared in Question 2.

Chapter

5

BOOKKEEPING: THE MECHANICS OF ACCOUNTING

Up to this point, we have been recording transactions by changing balance sheet items to show the effect of *each* transaction separately. Thus, if we started with a balance sheet that contained the item "Cash, $10,000," and we wished to record a transaction involving an increase in cash of $5,000, we would erase the $10,000 and put in the new figures, $15,000. This procedure was appropriate in view of the small number of transactions with which we have been dealing. Clearly, however, such a technique would be impractical as a way of handling the tremendous quantity of transactions that occur in actual business operations. This chapter describes some of the bookkeeping procedures that are used in practice to handle accounting transactions. It should be emphasized that no new accounting concepts are introduced in this chapter; the devices described here are no more than the mechanical means of increasing the facility with which transactions can be recorded and summarized.

Why Study Bookkeeping?

In this study of management accounting, we are not concerned with bookkeeping procedures *per se,* that is, for the purpose of training bookkeepers. Some knowledge of accounting mechanics is useful, however, for at least two reasons. First, as is the case with many subjects, accounting is something that is best learned by doing—by the actual solution of problems—and although any management accounting problem can theoretically be solved without the aid of the devices discussed in this chapter, the use of these tools will often speed up considerably the problem-solving process. Secondly, the debit-and-credit mechanism, which is the principal technique discussed here, provides a framework for analysis with much the same purpose, and the same advantages, as

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the symbols and equations that are studied in elementary algebra. This mechanism can often be used to reduce an apparently complex, perhaps almost incomprehensible, statement of facts to a simple, specific set of relationships. Thus, the debit-and-credit mechanism provides a useful way of thinking about many types of business problems—not only strictly accounting problems but also problems of other types.

BOOKKEEPING TOOLS

The Account

Consider again a balance sheet on which the item "Cash, $10,000" appears. Subsequent cash transactions can affect the cash balance in only one of two ways: they can increase it, or they can decrease it. Rather than increasing or decreasing the item by erasing the old figure and entering the new figure for each transaction, we could save considerable effort if we collected a number of increases together and a number of decreases together and then figured in a single arithmetic operation the net change resulting from all of them. We could do this by adding the sum of the increases to the amount of cash shown at the beginning and then subtracting the sum of the decreases. The difference would be the new cash balance, reflecting the net effect of all the separate increases and decreases.

In accounting, the device called an *account* is used for just this purpose. The simplest form of account, called a *T-account,* looks like this:

CASH

(Increases)		(Decreases)
Beginning balance	10,000	2,000
	5,000	600
	4,000	400
	100	1,000
	2,700	
	800	
	22,600	4,000
New balance	18,600	

All increases are listed on one side, and all decreases are listed on the other. The saving in effort can be seen even from this brief illustration. If we changed the balance for each of the eight transactions listed, we would have to make four additions and four subtractions. By using the account, we obtain the new balance by only two additions (to find the 22,600 and 4,000) and one subtraction (22,600 — 4,000).

Note that the dollar sign ($) is omitted; this is the usual practice in most accounting procedures.

In actual accounting systems, the account form is usually set up so that other useful information, in addition to the amount of each increase or decrease, can be recorded. A common arrangement of the columns is the following:

CASH

Date	Explanation	(R)	Amount	Date	Explanation	(R)	Amount

The above headings are self-explanatory except that of "R" (standing for "reference") under which is entered a simple code showing the source of the information recorded. This is useful if it is necessary to check back on the source of the entry at some future time.

The beginning student may find it helpful to write in the "Explanation" column the title of the account to which the offsetting entry is made, although this is often considered unnecessary in practice. For example, if an increase in Cash arises because of cash sales, the word "sales" may be written in the Explanation column in the Cash account and the word "cash" in the Explanation column of the Sales account. If there are several offsetting accounts, the word "sundries" may be used in the Explanation column. When a new balance is calculated and written in the account, it is identified by the word "balance" in the Explanation column.

Debit and Credit

The left-hand side of any account is arbitrarily called the *debit* side, and the right-hand side is called the *credit* side. Figures entered, or to be entered, on the left-hand side are called "debits" and figures on the right-hand side, "credits." The verb "to debit" (or "to charge") means "to make an entry in the left-hand side of an account," and the verb "to credit" means "to make an entry in the right-hand side of an account." *The words "debit" and "credit" have no other meaning in accounting.* The preceding sentence is emphasized because in ordinary usage these words have other meanings; thus, the student may be tempted to carry over into his study of accounting the impression that "credit" has a favorable connotation (such as: "he is a credit to his country") and that debit has an unfavorable connotation (from the term "debtor"). Such is not the case in the accounting usage of these words. "Debit" and "credit" are usually abbreviated to "Dr." and "Cr."

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If an account were considered by itself, without regard to its relationship with other accounts, it would make no difference whether increases were recorded on the debit side or on the credit side. Hundreds of years ago, however, someone had the ingenious notion of arranging accounts in such a way that the dual aspect that is present in every accounting transaction would be expressed by a debit amount and an equal and offsetting credit amount. This made possible the rule, *to which there are absolutely no exceptions,* that for each transaction the debit amount (or the sum of all the debit amounts, if there are more than one) must equal the credit amount (or the sum of all the credit amounts). It follows, therefore, that the recording of a transaction in which debits do not equal credits is incorrect. It also follows that, for all the accounts combined, the sum of the debit balances must equal the sum of the credit balances; otherwise, something has been done incorrectly. Thus the debit and credit arrangement used in accounting provides a useful means of checking the accuracy with which the work has been done.

The student could reason out such an arrangement for himself from the simple equation: Assets = Liabilities + Owners' Equity. The rules of debit and credit are merely an expansion of the algebraic relationships that follow from this equation. He may find it easier, however, to memorize the following five rules:

1. Increases in *assets* are debits; decreases are credits.
2. Increases in *liabilities* are credits; decreases are debits.
3. Increases in *owners' equity* are credits; decreases are debits.
4. Increases in *expense* are debits; decreases are credits.
5. Increases in *revenue* are credits; decreases are debits.

Rule No. 4 follows from the fact that expense items really represent decreases in owners' equity, and Rule No. 5 follows from the fact that revenue items represent increases in owners' equity.

These rules are illustrated in the diagram shown in Illustration 5–1.

Debits and credits to certain special accounts are not covered by these rules, but they can be deduced from them. As an example, let us consider the accounts that were listed in the cost of goods sold analysis in the preceding chapter (page 74), which read in part:

Beginning inventory		$ 400
Plus: Purchases, gross	$700	
Plus: Freight-in	60	
	$760	
Less: Purchase returns	20	
Net purchases		740
Goods Available for Sale		$1,140

Illustration 5–1

RULES OF DEBIT AND CREDIT

ASSETS =

Asset Accounts
(Example: Cash)

Dr.	Cr.
Increases (+)	Decreases (−)

EQUITIES

Liability Accounts
(Example: Accounts Payable)

Dr.	Cr.
Decreases (−)	Increases (+)

Owners' Equity Accounts
(Example: Retained Earnings)

Dr.	Cr.
Decreases (−)	Increases (+)

TEMPORARY SUBDIVISIONS OF RETAINED EARNINGS

Expense Accounts
(Example: Wage Expense)

Dr.	Cr.
Increases (+)	Decreases (−)

Revenue Accounts
(Example: Sales)

Dr.	Cr.
Decreases (−)	Increases (+)

Starting with the known fact that Inventory is an asset account and therefore increases on the debit side, we can easily deduce the rules for the other accounts by examining their relationship to inventory and to one another. Purchases represent an addition to inventory; therefore, the Purchases account is treated the same as the Inventory account; i.e., increases in Purchases are debits, and decreases are credits. Freight-In is added to Purchases; therefore, the rule applying to it is the same as the rule for Purchases. Purchase Returns, however, represents a decrease in Purchases, so the rules for this account are the opposite of the rules for Purchases; i.e., increases in Purchase Returns are credits, and decreases are debits. By similar reasoning, the rules applying to any unfamiliar account may be constructed.

The Ledger

A ledger is a group of accounts. The student has probably seen a bound book with the word "ledger" printed on the cover. All the accounts of a small business could be maintained in such a book. Or, the business might have an "Accounts Receivable Ledger," an "Accounts Payable Ledger," and a "General Ledger," each containing the group

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of accounts suggested by the title. The ledger is not necessarily a bound book; it may consist of a set of loose-leaf pages, a set of punched cards, or even, in a few cases, a set of coded dots on a reel of magnetic tape. No matter what its form may be, the essential character of the account and the rules for making entries to it remain exactly as stated above.

The ledger will contain at least as many separate accounts as there are items on the balance sheet and income statement. Usually there are more accounts than this minimum number so that information can be collected in more detail than is reported on the financial statements. The number of accounts is governed by management's need for information. For example, although the single item "accounts receivable" ordinarily appears on the balance sheet, there are obvious advantages in maintaining in the ledger a separate account for each customer.

There is no limit, other than the cost of record keeping, to the proliferation of accounts that may be found in practice. Take, for example, transactions concerned with the inflow and outflow of merchandise in a store. In the simplest set of books, all such transactions could be recorded as debits or credits to a Merchandise Inventory account. Or, additional information could be obtained by setting up a Purchases account, in which all purchases of merchandise during the accounting period are recorded, or there could be several Purchases accounts, one for each type of merchandise. Carrying the complications further, the Purchases account (or accounts) could be further subdivided so as to record in separate accounts: (1) the invoice cost of merchandise purchased, (2) inward freight, (3) discounts allowed on purchases, and (4) merchandise returned to vendors (i.e., purchase returns). The inward freight item could be subdivided according to the several means of transportation used, or into an account for the freight bills themselves and another account for transportation taxes; and so on.

The Journal

The journal is a chronological record of accounting transactions showing the names of accounts that are to be debited or credited, the amounts of the debits and credits, and any useful supplementary information about the transaction.

A simple form of the journal is shown in Illustration 5–2. Note that the debit entry is listed first, that the debit amounts appear in the first of the two money columns, that the account to be credited appears below the debit and is indented, and that credit amounts appear in the second money column. "LF" is an abbreviation for "ledger folio," i.e., the page reference to the ledger account where the entry is to be made;

Illustration 5–2

1956		Transactions	LF	Debit	Credit
Jan.	2	Cash	1	5,000.00	
		Sales	46		5,000.00
	2	Accounts Receivable	7	1,525.00	
		Sales	46		1,525.00
	2	Merchandise Purchases	27	7,500.00	
		Supplies Expense	34	70.00	
		Accounts Payable	18		7,570.00
	3	Accounts Receivable		1,395.00	
		Sales			1,395.00
	3	Accounts Payable		2,000.00	
		Cash			2,000.00
	3	Cash		4,000.00	
		Accounts Receivable			4,000.00

these references are inserted at the time the entry is recorded in the account, and their presence indicates that the entry has been recorded. (In the illustration, the first seven items have been recorded in the accounts, and the remaining six have not yet been recorded.)

The journal contains explicit instructions as to the changes that are to be made to the balances in the accounts. The process of making these changes is called *posting.* No account balance is ever changed except on the basis of a journal entry. (The *balance* in the account may be periodically computed and recorded, as explained on page 96, but this process does not in any way *change* the balance in the account.)

Thus, the ledger is a device for *reclassifying and summarizing,* by accounts, information which is listed in chronological order in the journal.

Special Journals

As was the case with the ledger, a wide variety of forms is used for journals. The form shown above is called the *general journal* form. This form requires that each account affected by each entry be written down. If there are a large number of entries made to a single account, time can be saved, both in journalizing and in posting, by using a *special journal* or *register.* In the special journal there are several columns, each headed with the name of an account that is to be debited or credited plus, usually, a miscellaneous column in which entries to other accounts may be recorded. Entries to the accounts indicated by column headings are made simply by entering the proper amount in these columns. At the end of the accounting period, all the amounts in each column are added, and the total is posted as one figure to the appropriate account. Entries in the miscellaneous column are posted individually. Illustration 5–3 is an example of a Check Register, which is a special journal used to record credits to Cash and debits to various accounts. Columns are provided for the accounts in which entries are likely to be made frequently (here, Cash and Accounts Payable), and a miscellaneous column is provided for other debits.

Illustration 5–3

CHECK REGISTER

Date	To Whom Drawn	Cash Cr.	Accounts Payable Dr.	Miscellaneous Dr.	
				Account	Amount

THE ADJUSTING AND CLOSING PROCESS

Adjusting Entries

The great majority of entries that are to be made in accounts come to the accountant's attention easily and obviously. When checks are drawn, it is obvious that an entry must be made crediting Cash and debiting some other account. When invoices are sent out, a credit to Sales and a debit to Accounts Receivable is obviously generated. Entries of this type are called *original entries* and constitute the bulk of the entries made in the typical business.

Other entries are not evidenced by some obvious document. These entries are made only at the end of an accounting period, and they are called *adjusting entries.* Adjusting entries are made for one of the following reasons: (1) some transactions actually occur continuously during the accounting period, but for convenience they are recorded in the accounts only at the end of the accounting period; or (2) some events that affect the accounts are not described on any of the routine documents that flow through the accounting office.

The types of events that require adjusting entries were described in Chapter 4. The expiration of insurance cost will be considered illustrative of all such events. Assume that on January 1, 1955, a company's balance sheet showed the asset, prepaid insurance, in the amount of $900, representing prepayment of the cost of insurance protection for 1955, 1956, and 1957. Each day in 1955 a portion of this protection is used up, but rather than record the event daily, a single adjusting entry is made at the end of 1955 to record the expense for the whole year and to show the corresponding decrease in the asset value, as follows:

*dr. Insurance Expense	300	
cr. Prepaid Insurance		300

Each of the other types of events described in Chapter 4 is similarly journalized as an adjusting entry at the end of the accounting period.

When the student is given a problem involving the preparation of accounting statements, he must be told the precise nature of the original entries since he has no way of finding them out for himself. He will not necessarily be told about the adjusting entries, however; and he, like any accountant, is expected to be on the lookout for situations that require adjustment so that the accounts will reflect properly the status of the business. For example, if the balance sheet at the beginning of a period shows the asset, prepaid insurance, the accountant knows that he must make an adjusting entry at the end of the period to show the expired cost, even though no routine document tells him to do so.

Two types of adjusting entries, those for depreciation and for bad debt expense, will be discussed in detail in Chapter 6. These entries occur, however, in some of the cases accompanying the present chapter, and a brief explanation of them is accordingly given here.

Depreciation expense is the name given to that part of the cost of fixed assets which is charged as an expense of the current accounting period, and *accumulated depreciation* is the name given to the total part of the fixed asset's cost that has been charged off to date. Thus one of the adjusting entries is:

dr. Depreciation Expense	xx	
cr. Accumulated Depreciation		xx

Fixed assets are shown on the balance sheet as in the following illustration:

Equipment (at cost)	$1,000	
Less: Accumulated depreciation	200	
Net Book Value		$800

The entry for *bad debt expense* is made in order to recognize the likelihood that not all credit customers will pay their bills and that therefore the Accounts Receivable account may overstate the real value of the company's claims against its customers. The adjusting entry that records the estimated amount of bad debts is:

---

* As a reminder to the student, the notations "dr." and "cr." are used in Chapters 5, 6, and 7 to designate the debit and credit portions of each journal entry. These notations are not used in practice since the accountant understands what is meant by the order and indentation of the accounts.

dr. Bad Debt Expense	xx	
cr. Allowance for Doubtful Accounts		xx

The accounts receivable item then appears on the balance sheet as in the following illustration:

Accounts receivable (gross)	$1,000	
Less: Allowance for doubtful accounts	50	
Net Accounts Receivable		$950

Closing Entries

Revenue accounts and expense accounts are called temporary (or "nominal") accounts, as distinguished from asset, liability, and owners' equity accounts which are called *permanent* (or "real") accounts. The temporary accounts are actually subdivisions of owners' equity. They are a means of classifying the various revenue and expense transactions that occur during an accounting period. Such a classification provides the information needed to prepare the income statement for the period. The temporary accounts are periodically *closed* to owners' equity in order to determine the net effect (i.e., the profit or the loss) or the various revenue and expense transactions.

Closing procedures differ from company to company. Under all closing methods, however, revenue and expense accounts are ultimately closed to an account called *Profit and Loss* or *Loss and Gain,* which reflects the net profit or loss for a given accounting period. Loss and Gain is a temporary account which in turn is closed to some owners' equity account, such as Retained Earnings, to complete the closing process. In many businesses, the revenue and expense accounts are not closed directly to Loss and Gain. Instead, one or more additional temporary or *clearing* accounts are set up, such as Cost of Goods Sold and Trading (an account which shows the gross profit for the period), and successive closings are made to these accounts. The purpose of these intermediate clearing accounts is to show separately some or all of the elements comprising Loss and Gain (e.g., cost of goods sold and gross profit). The ultimate effect, however, is the same as direct closing to Loss and Gain.

The *closing* process consists of transferring the balance of each temporary account to the same side of a clearing account. This is done by making a journal entry debiting the account to be closed if it has a credit balance (or crediting it if it has a debit balance) in an amount equal to the balance. This has the effect of reducing the balance in the account to zero, thereby closing it. Each entry is made on the opposite side from the balance in order to reduce the balances in the accounts to zero. The other half of this entry is made to Loss and Gain or to one of the intermediate clearing accounts. Thus, if the balance in the Sales account at the end of an accounting period is $46,482.80 (a credit), the account is closed by the following entry:

dr. Sales	46,482.80	
cr. Loss and Gain		46,482.80

A description of the steps involved in a frequently used closing cycle for a merchandising business is given below. Journal entries are not given, but instead the process is shown diagrammatically in Illustration 5–4. In this cycle, two clearing accounts, Cost of Goods Sold, and Loss and Gain, are used.

1. The Merchandise Inventory account is debited with the inventory on hand at the end of the period, and Cost of Goods Sold is credited with this amount. (In one sense, this is an adjusting rather than a closing entry, but the distinction is not important.)
2. Purchases and any accounts associated therewith, such as Purchase Returns and Purchase Discounts, are closed to Cost of Goods Sold.
3. The Merchandise Inventory account is credited with the amount of the inventory on hand at the beginning of the period, and Cost of Goods Sold is debited with this amount.
4. The balance in Cost of Goods Sold is closed to Loss and Gain by crediting Cost of Goods Sold and debiting Loss and Gain.
5. Sales and any accounts connected therewith, such as Sales Returns and Sales Discounts, are closed to Loss and Gain.
6. Operating expense accounts, including general, administrative and selling expenses, are closed to Loss and Gain.
7. Nonoperating revenue accounts (frequently termed "Other Income" in the income statement) are closed to Loss and Gain.
8. Nonoperating expense accounts are closed to Loss and Gain.
9. Income Tax expense is closed to Loss and Gain.
10. The balance in Loss and Gain, which now represents the net profit or loss for the period, is closed to Retained Earnings or a similar owners' equity account.

At the completion of the closing process, all temporary accounts have zero balances; the only accounts remaining open are the permanent accounts—the asset, liability, and owners' equity accounts.

Ruling and Balancing Accounts

At the end of the accounting period, each account is ruled and balanced so that it is in a convenient form for the preparation of finan-

Illustration 5–4

THE CLOSING PROCESS IN A MERCHANDISING COMPANY

Merchandise Inventory

Bal.	44,600	(3)	44,600
(1)	35,000		

Purchases

Bal.	113,400	(2)	113,400

Purchase Discount

(2)	1,700	Bal.	1,700

Rental and Other Space Costs

Bal.	8,300	(6)	8,300

Salaries and Wages

Bal.	21,000	(6)	21,000

Soc. Sec. Tax Expense

Bal.	700	(6)	700

Advertising Expense

Bal.	2,100	(6)	2,100

Insurance Expense

Bal.	300	(6)	300

Miscellaneous Expense

Bal.	1,900	(6)	1,900

Interest Expense

Bal.	300	(8)	300

Sales

(5)	174,000	Bal.	174,000

Nonoperating Revenue

(7)	400	Bal.	400

Income Tax Expense

Bal.	5,400	(9)	5,400

Cost of Goods Sold

(2)	111,700	(1)	35,000
(3)	44,600	(4)	121,300
	156,300		156,300

Loss and Gain

(4)	121,300	(5)	174,000
(6)	34,300	(7)	400
(8)	300		
(9)	5,400		
(10)	13,100		
	174,400		174,400

Retained Earnings

		Bal.	1,300
		(10)	13,100

Notes:

"Bal." indicates the balance in the account after adjustments but before the closing process has started. This balance is, in most accounts, the net result of numerous transactions that have been recorded during the accounting period. Numbers in parentheses ( ) refer to the steps described in the text.

cial statements and ready to begin accumulating entries for the coming period. A frequently followed procedure is as follows: First, a balancing amount is written in the appropriate column so as to make equal totals in both columns. The totals are then shown and double ruled to indicate the end of the accounting period sequence. Finally, the new balance is "brought down" on the opposite side from that in which it was first written, as the initial figure for the new period.

This process, together with several variations, is further described and illustrated in Illustration 5–5.

The Trial Balance

The trial balance is simply a list of the account names and the balances in each account as of a given moment of time, with debit balances in one column and credit balances in another column. The preparation of the trial balance serves two principal purposes: (1) it shows whether the equality of debits and credits has been maintained, and (2) it provides a convenient transcript of the ledger record as a basis for making adjusting and closing entries or in the preparation of financial statements.

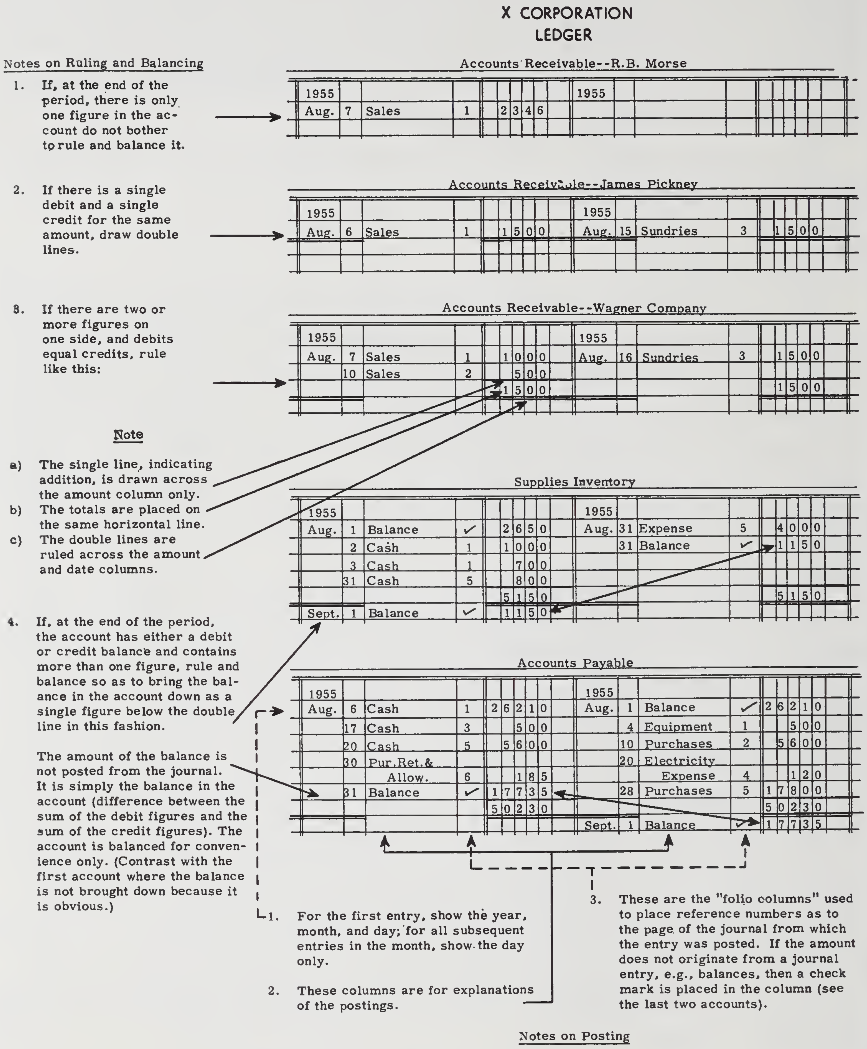
To maintain the relationship "total assets = total liabilities + owners' equity," debits and credits must be kept in balance. Although the fact that totals on a trial balance are equal does indicate that the integrity of the accounting equation has been maintained, it does not prove that errors have not been made. Entries may be omitted entirely; they may have been posted to the wrong account; counterbalancing errors may have been made; or the transaction may have been analyzed incorrectly. For example, when a debit for the purchase of a truck is made incorrectly to an expense account rather than correctly to a fixed asset account, the totals of the trial balance are not affected. However, errors that result in unequal debits and credits are common, and the fact that such errors exist is evident when a trial balance does not balance; that is, when the debit column does not add to the same total as the credit column.

The Work Sheet

The work sheet is a preliminary compilation of figures that facilitates recording or analysis. A work sheet is often used as a preliminary to the formal journalizing and posting of the adjusting and closing process. Its use permits the accountant to make a "dry run" of the whole process. Since a pencil is ordinarily used, any errors detected on the work sheet

Illustration 5–5

SOME SUGGESTIONS ON THE MECHANICS OF POSTINGS AND RULINGS



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Notes on Ruling and Balancing

1. If, at the end of the period, there is only one figure in the account do not bother to rule and balance it.

Accounts Receivable--R.B. Morse

1955					1955				
Aug.	7	Sales	1	2346					

2. If there is a single debit and a single credit for the same amount, draw double lines.

Accounts Receivable--James Pickney

1955					1955				
Aug.	6	Sales	1	1500	Aug.	15	Sundries	3	1500

3. If there are two or more figures on one side, and debits equal credits, rule like this:

Accounts Receivable--Wagner Company

1955					1955				
Aug.	7	Sales	1	1000	Aug.	16	Sundries	3	1500
	10	Sales	2	500					
				1500					1500

Note

a) The single line, indicating addition, is drawn across the amount column only.
b) The totals are placed on the same horizontal line.
c) The double lines are ruled across the amount and date columns.

Supplies Inventory

1955					1955				
Aug.	1	Balance	✓	2650	Aug.	31	Expense	5	4000
	2	Cash	1	1000		31	Balance	✓	1150
	3	Cash	1	700					
	31	Cash	5	800					
				5150					5150
Sept.	1	Balance	✓	1150					

4. If, at the end of the period, the account has either a debit or credit balance and contains more than one figure, rule and balance so as to bring the balance in the account down as a single figure below the double line in this fashion.

The amount of the balance is not posted from the journal. It is simply the balance in the account (difference between the sum of the debit figures and the sum of the credit figures). The account is balanced for convenience only. (Contrast with the first account where the balance is not brought down because it is obvious.)

Accounts Payable

1955					1955				
Aug.	6	Cash	1	26210	Aug.	1	Balance	✓	26210
	17	Cash	3	500		4	Equipment	1	500
	20	Cash	5	5600		10	Purchases	2	5600
	30	Pur.Ret.& Allow.	6	185		20	Electricity Expense	4	120
	31	Balance	✓	17735		28	Purchases	5	17800
				50230					50230
					Sept.	1	Balance	✓	17735

1. For the first entry, show the year, month, and day; for all subsequent entries in the month, show the day only.

2. These columns are for explanations of the postings.

3. These are the "folio columns" used to place reference numbers as to the page of the journal from which the entry was posted. If the amount does not originate from a journal entry, e.g., balances, then a check mark is placed in the column (see the last two accounts).

Notes on Posting

can be easily corrected, whereas alterations to the formal records are to be avoided wherever possible.

The form of the adjusting-and-closing work sheet varies depending upon the procedure followed in closing the books, the form of the statements to be prepared, and the preference of the accountant. The work sheet consists of a number of pairs of columns, the first column in each pair being used for debits and the second column for credits. On most work sheets the first pair of columns contain the *pre-adjust-*

ment trial balance; that is, the balances in the accounts after the original entries have been posted, but prior to the beginning of the adjusting and closing process. The next pair of columns often is used for the adjustments for the period. Next there may be a pair of columns labeled "Loss and Gain," and finally a pair labeled "Balance Sheet." To these last two pairs of columns, the appropriate adjusted trial balance items are extended.

Additional pairs of columns are sometimes included in the work sheet. For example, there may be a pair labeled "Cost of Goods Sold," to which are extended the balances of all accounts which make up the cost of goods sold section of the income statement. Some companies use several clearing accounts to which the revenue and expense accounts are closed before the ultimate closing to Loss and Gain, and these companies usually include on their work sheets pairs of columns for each of these clearing accounts. Even companies that close all revenue and expense accounts directly to Loss and Gain might still include on their work sheets such columns as Cost of Goods Sold and Trading. The inclusion of these columns is useful in the preparation of the income statement, for they classify the revenue and expense accounts as they will be classified in the income statement. Thus, many companies use a detailed work sheet but simply close all temporary accounts directly to Loss and Gain.

A work sheet is often used *in lieu of,* rather than as a preliminary to, the process of adjusting and closing the accounts. Many companies close their books only once a year, but nevertheless prepare monthly financial statements. These interim statements are prepared from a work sheet on which is listed the account balances at the end of the month together with the adjustments necessary to reflect revenue and expense in that month. Statements are prepared directly from the adjusted account balances that are developed on this work sheet.

A sample work sheet for a merchandising company is shown in Illustration 5–6. The five adjustments shown thereon reflect:

a) Expired insurance of $300.
b) Accrued interest expense of $100.
c) Accrued wages and salary expense of $1,000, of which $200 represents employee tax deductions and $800 is owed employees.
d) The employer's tax on these salaries and wages, amounting to $100.
e) Estimated income tax for the year of $5,400.

Note that the ending inventory of $35,000 is entered in the credit column of "Loss and Gain" and the debit column of "Balance Sheet." There are several other ways in which the ending inventory can be recorded, although the one shown in Illustration 5–6 is common.

Illustration 5–6

ILLUSTRATIVE WORK SHEET

(In Round Numbers to Facilitate Study)

	Trial Balance, December 31, 1955		Adjustments		Loss and Gain		Balance Sheet	
	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.
Cash	18,600						18,600	
Inventory, 1/1/55	44,600				44,600			
Prepaid insurance	900			300 (*a*)			600	
Accounts payable		8,700						8,700
Withholding and social security taxes payable		500		200 (*c*) 100 (*d*)				800
Notes payable		4,000						4,000
Capital stock		20,000						20,000
Retained earnings		1,300						1,300
Sales		174,000				174,000		
Purchases	113,400				113,400			
Purchase discount		1,700				1,700		
Rental and other space costs	8,300				8,300			
Salaries and wages	20,000		1,000 (*c*)		21,000			
Social security tax expense	600		100 (*d*)		700			
Advertising expense	2,100				2,100			
Miscellaneous expenses	1,900				1,900			
Nonoperating revenue		400				400		
Interest expense	200		100 (*b*)		300			
	210,600	210,600						
Inventory, 12/31/55						35,000	35,000	
Insurance expense			300 (*a*)		300			
Accrued interest payable				100 (*b*)				100
Wages payable				800 (*c*)				800
Income tax expense			5,400 (*e*)		5,400			
Income tax liability				5,400 (*e*)				5,400
Net Income to Retained Earnings					13,100			13,100
			6,900	6,900	211,100	211,100	54,200	54,200

Note also the last item, $13,100. This is the net income for the period and is found by subtracting the sum of the other debits to Loss and Gain from the sum of the credits to Loss and Gain. After this amount is transferred to the Balance Sheet column, the two columns in this section add to the same total, which is a check on the accuracy of the arithmetic in the whole closing process.

So that the connection between the adjusting and closing process and the financial statements will be clear, financial statements prepared from the illustrations used in this chapter are shown in Illustration 5–7.

Illustration 5–7

FINANCIAL STATEMENTS PREPARED FROM DATA SHOWN IN ILLUSTRATIONS 5–4 AND 5–6

Balance Sheet as of December 31, 1955

ASSETS		EQUITIES	
Cash	$18,600	Accounts payable	$ 8,700
Inventory	35,000	Withholding and social security taxes payable	800
Prepaid insurance	600	Wages payable	800
		Notes payable	4,000
		Accrued interest payable	100
		Income tax liability	5,400
		Total Liabilities	$19,800
		Capital stock	20,000
		Retained earnings	14,400
Total Assets	$54,200	Total Equities	$54,200

Income Statement for the Year 1955

Sales		$174,000
Beginning inventory	$ 44,600	
Plus: Purchases (net)	111,700	
	$156,300	
Less: Ending inventory	35,000	
Cost of goods sold		121,300
Gross profit		$ 52,700
Operating expenses:		
Rental and other space costs	$ 8,300	
Salaries and wages	21,000	
Social security tax expense	700	
Advertising expense	2,100	
Insurance expense	300	
Miscellaneous expense	1,900	34,300
Operating profit		$ 18,400
Less: Interest expense		300
		$ 18,100
Plus: Nonoperating revenue		400
Profit before income taxes		$ 18,500
Provision for income taxes		5,400
Net Income		$ 13,100

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The student will of course recognize that all figures used are condensed and rounded in order to make the process easier to see. These statements therefore do not indicate the amount of detailed work that is involved in an actual business situation.

SUMMARY OF THE ACCOUNTING PROCESS

1. The first, and by far the most important, part of the accounting process is the *analysis of transactions;* that is, the process of deciding which account or accounts should be debited and which accounts should be credited, and in what amounts, in order to reflect events in the accounting records. This requires judgment.

2. Next comes the purely mechanical step of *journalizing original entries;* i.e., recording the result of the analysis.

3. *Posting* is the process of recording changes in the ledger accounts, exactly as specified by the journal entry. This is another purely mechanical step.

4. At the ending of the accounting period, judgment is involved in deciding on the *adjusting entries,* and these are journalized and posted in the same way as are original entries.

5. The *closing entries* are journalized and posted. This is another mechanical step.

6. *Financial statements* are prepared. This requires judgment as to the best arrangement and terminology, but the figures that are used result from the judgments made in steps No. 1 and No. 4.

APPENDIX

Locating Errors Revealed by the Trial Balance

Following are four suggested aids in detecting errors revealed by differences in the totals of the trial balance.

1. If the difference between the total is 1, 0.01, 1.00, 100, 1,000, etc., the error is probably in addition. Such an error is usually detected by re-adding the columns of the trial balance, or, if necessary, the columns in the ledger accounts.

2. When the discrepancy is an even number, the error may be the result of making a debit entry in a credit column, or vice versa. Divide the difference by 2, and look, first, through the trial balance and, then, the ledger accounts for an amount corresponding to the quotient secured. The difference is divided by 2 because an item placed in the wrong column results in a difference of twice its amount.

3. If the difference is divisible by 9, the error may be due to a *transposition* of figures; that is, 79 may have been written for 97, 318 for 813, or 7,638 for 8,637. The first example is a one-column transposition, the second is a two-column transposition, and the third is a three-column transposition. If the discrepancy is divisible by 9 and is a one-column transposition (such as the transposition above of 79 for 97), the difference resulting from this transposition (i.e., 18) is in turn divided by 9 to give 2, which indicates the difference between the transposed figures, here 9 and 7. The search through the trial balance for such a transposed figure can therefore be restricted to such of the digits that differ by 2, e.g., 0 and 2, 1 and 3, 2 and 4, 7 and 9, etc. Although two- and three-column transpositions which result in large differences do not occur frequently, a similar clue to the figures transposed is found by dividing the differences by 99 and 999. The error itself must be located in the same manner as with a one-column transposition.

4. A difference divisible by 9 may also occur when the digits of a number are moved one or more places to the right or left without change in the order of the figures. For example, $6,328.00 may be written as $632.80 or $63.28. The first is a one-column *transplacement,* and the second is a two-column transplacement. The error caused by a one-column transplacement is divisible by 9, and that caused by a two-column transplacement by 99. The division of the difference by 9 or 99, as the case may be, always gives the figures (disregarding the decimals) whose transplacement caused the error. Transplacement of $6,328 as $632.80 would cause a difference in the trial balance totals of $5,695.20, which divided by 9 gives $632.80. Having determined the possible numbers transplaced, search the trial balance and ledger accounts for figures in that sequence. There is no way of knowing in advance if the difference is the result of a one- or two-column transplacement, so divide first by 9 and, if the result does not disclose the numbers transplaced, then divide by 99.

When the source of error is not readily discernible, it is advisable to check the trial balance against the ledger to determine whether all the account balances have been copied properly. This check may reveal that certain accounts have been omitted. As a last resort, it may be necessary to check all of the figures in the ledger with the journal and to check all additions and subtractions in the several accounts.

Care in making the entries, such as writing legibly, double checking additions and subtractions as journalizing and posting proceeds, and making sure all entries are entered properly, will save much time otherwise spent in hunting for errors.

CASES

CASE 5–1. CORBY COMPANY

The account balances in the ledger of the Corby Company on December 31, before adjustments, were as follows:

Debit Balances		*Credit Balances*	
Cash	$ 5,200	Accumulated depreciation on store equipment	$ 2,800
Accounts receivable	18,700	Notes payable	12,000
Merchandise inventory (January 1)	15,920	Accounts payable	19,200
Store equipment	12,000	Common stock	15,000
Supplies inventory	2,700	Retained earnings	7,800
Prepaid insurance	1,200	Sales	100,000
Merchandise purchases	85,670	Purchase discounts	1,800
Freight-in	3,000		
Selling expenses	2,000		
Sales salaries	7,000		
Miscellaneous general expenses	4,000		
Sales discounts	350		
Interest expense	750		
Social security tax expense	110		
Total	$158,600		$158,600

The data for adjustments are:

Merchandise inventory, December 31, $22,000.
Depreciation on store fixtures, $1,200.
Supplies inventory, December 31, $300. (Purchases of supplies during the year were debited to the Supplies Inventory account.)
Expired insurance, $900.
Interest accrued on notes payable, $70.

Questions

1. Journalize all adjusting and closing entries.
2. Prepare a balance sheet as of December 31 and an income statement for the year ending December 31.

CASE 5–2. EASTSIDE PHARMACY

Sam Parker was the owner of the Eastside Pharmacy. His General Ledger contained the following net worth and revenue and expense accounts, which before adjustments had balances as shown below for the month ending August 31. (Asset and liability accounts are not shown.)

Sam Parker, capital	$8,000	Miscellaneous selling expenses	$ 70
Sam Parker, withdrawals (debit balance)	200	Rent expense	130
Sales	4,100	Bad debt expense	0
Purchases	2,700	Miscellaneous general expenses	135
Sales salaries	200	Rent income	120
Advertising expense	50	Purchase discounts	30
Store supplies used	0	Interest income	5
Expired insurance	0	Interest expense	18
		Cost of goods sold	0
		Loss and gain	0

Adjusting entries based on the following information are required in order to determine the net income or loss for the month of August:

a) Merchandise inventories: August 1, $2,300; August 31, $1,810.
b) Rent income of $120 represents three months' rent received in advance on August 1 for the subletting of the fountain and lunch counter.
c) Allowance for bad debts, $25.
d) Interest has accrued for one month on a $400, 6 per cent note received on August 1 from a former tenant of the fountain for unpaid rent.
e) Sales salaries unpaid, $50. (Disregard social security taxes.)
f) Store supplies used, $25.
g) Interest cost of $18 represents amount deducted from a ninety-day note payable for $1,200 discounted at 6 per cent by the bank, August 16 (count as half a month).
h) Insurance coverage expiring during the month, $15.

Questions

1. Journalize all adjusting and closing entries.
2. Prepare an income statement for the month ending August 31.

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Chapter

6

ACCOUNTS RECEIVABLE AND FIXED ASSETS

The two topics to be discussed in this chapter are not closely related. They are taken up here because these two topics, more than any others, seem to cause special difficulty to the beginning student of accounting.

ACCOUNTS RECEIVABLE

The main source of revenue in many businesses is the sale of merchandise to customers for credit, i.e., "on account." This transaction gives rise to the asset, accounts receivable, and to an increase in sales revenue and hence in owners' equity. Let us assume that the Essel Company began operations in 1954 and that during the year the company made sales of $262,250, all on credit. In the interest of simplicity, let us further assume that none of the customers had paid their bills by the end of 1954. The record made of these transactions would show Accounts Receivable in the amount of $262,250 and Sales of $262,250. It would be correct to report $262,250 as an asset on the balance sheet as of the end of 1954 and $262,250 as sales on the income statement for 1954 if, *but only if,* it is believed that the customers eventually will pay their obligations to the Essel Company. The unfortunate fact is, however, that some of these customers may never pay their bills; that is, their accounts become *bad debts.*

Consider the extreme case: the person who purchases merchandise with no intention of paying for it and with no means of paying for it, and who in fact does not pay for it. In this case, the company has not made a sale at all; rather, it has made a gift. Futhermore, nothing valuable has been added to the asset, Accounts Receivable, as a result of this transaction. If this event is recorded as an increase in Sales and as an increase in Accounts Receivable, both these accounts will be overstated.

In the more usual bad debt situation, the customer fully intends to pay his bill, but for one reason or another he never actually does make payment. The effect is the same as that in the extreme case. Such a sale would, of course, be recorded initially by debiting Accounts Receivable and crediting Sales at the sales value of the merchandise. In this situation, a subsequent entry must be made to show that the amount debited to Accounts Receivable does not represent a valid asset and that owners' equity has not in fact increased by the amount of the sale. The adjustment in owners' equity to reflect the bad debt is viewed by some accountants as an adjustment in the sales figure and by others as the recognition of an expense that is almost inevitable in any business that extends credit to its customers.

Accounting Recognition of Bad Debts

When the company made the sale, the fact that the customer would never pay his bill was not known; otherwise the sale probably would not have been made. Even at the end of the accounting period, the company probably does not know which of the obligations carried as accounts receivable will never be collected. An estimate of the amount of bad debts can nevertheless be made, and it is customary to adjust the accounting records at the end of each accounting period to reflect this estimate.

One method of making this adjustment is by a *direct write-off.* Accounts that are believed to be uncollectible are simply eliminated from the records by subtracting the amount of the bad debt from Accounts Receivable and showing the same amount as an expense item on the income statement. The entry to accomplish this would be:

dr. Bad Debt Expense..200
cr. Accounts Receivable... 200

The direct write-off method, however, implies that the specific uncollectible accounts can be detected, whereas this usually is not possible. An alternative procedure, therefore, is to estimate the *total* amount of uncollectible accounts and to show this estimated amount as a deduction from accounts receivable on the balance sheet and as an expense on the income statement. Instead of reducing the accounts receivable figure directly, the estimate is shown as a separate figure on the balance sheet, so that the reader can observe both the total amount owed by customers and that portion of the amount which the company believes will not be collected.

The balance sheet item is often labeled *allowance for doubtful accounts* or *allowance for uncollectible accounts.* It may also be labeled "reserve for bad debts," but this is likely to cause confusion since the word "reserve" connotes to many people that a sum of money has been set aside, and such is not the case. The *allowance for doubtful accounts* is in the nature of a suspended credit to accounts receivable for specific, but as yet unknown, customers.

The amount added to the allowance for doubtful accounts during the accounting period is shown on the income statement as *bad debt expense* or *loss on bad debts.* Ordinarily, this item appears as one of the miscellaneous operating expenses shown below the gross profit, but some companies show it as a subtraction from gross sales, reflecting the belief that bad debts represent sales that never actually resulted in revenue; still others show it as a nonoperating expense. This possible difference in treatment should be kept in mind when comparing the income statements for two companies since the gross profit of one may reflect the recognition of bad debt expense, while that of the other may not.

Methods of Making the Estimate. Any one of several methods may be used to estimate the amount of bad debt expense in an accounting period. One method is to examine each of the customer accounts and to set up an amount that is large enough to equal those accounts that seem to be uncollectible. In companies with hundreds, or thousands, of customer accounts, an analysis of each individual account may not be feasible. A common practice, therefore, is to rely on some over-all formula developed on the basis of experience over a period of years. Some of the methods commonly used are as follows:

1. Estimate bad debt expense as a *percentage of total sales* for the period. This method can logically be used only when cash sales are either negligible or a constant proportion of total sales, for bad debt expense is not, of course, related to cash sales.
2. Estimate bad debt expense as a *percentage of credit sales.*
3. Adjust the Allowance for Doubtful Accounts so that it equals a prescribed *percentage of accounts receivable* outstanding at the end of the period.

The percentage used in each case depends on what the records show as to experience in the past and on management's judgment as to the extent to which past experience reflects the current situation.

The Adjusting Entry. Once the amount has been determined, it is recorded as one of the adjusting entries made at the end of the accounting period. If, in the Essel Company, management estimated that the Allowance for Doubtful Accounts should be 2 per cent of its accounts receivable of $262,250, the entry would be:

dr. Bad Debt Expense	5,245	
cr. Allowance for Doubtful Accounts		5,245

The accounts receivable section of the December 31, 1954, balance sheet would then appear as follows:

Accounts receivable	$262,250
Less: Allowance for doubtful accounts	5,245
Accounts Receivable, Net	$257,005

The income statement for 1954 would show bad debt expense in the amount of $5,245.

For reasons to be described, the Allowance for Doubtful Accounts usually will have a balance even before the adjusting entry is made. In these circumstances the amount reported as bad debt expense on the income statement will be different from the amount reported as allowance for doubtful accounts on the balance sheet. (In the Essel Company example given above, this did not occur because the company was organized in 1954 and the above entry was the first one made to Allowance for Doubtful Accounts.)

When the Allowance for Doubtful Accounts item has a balance, care must be taken in applying the formulas listed above. Formulas No. 1 and No. 2, which are related to sales, give the amount of bad debt *expense* for the period; this same amount is credited to whatever balance existed in Allowance to Doubtful Accounts prior to the entry. Formula No. 3, which is related to accounts receivable, gives the amount that is to appear as the Allowance for Doubtful Accounts; the journal entry is made in an amount that brings the Allowance for Doubtful Accounts *up to* the desired balance. For example, if at the end of 1955, in the Essel Company, Allowance for Doubtful Accounts had a credit balance of $1,000, and if it was decided that the allowance should be 2 per cent of accounts receivable, which at that time amounted to $300,000, the journal entry would be:

dr. Bad Debt Expense	5,000	
cr. Allowance for Doubtful Accounts		5,000

The balance sheet as of December 31, 1955, would then show:

Accounts receivable	$300,000
Less: Allowance for doubtful accounts	6,000
Accounts Receivable, Net	$294,000

Write-Off of an Uncollectible Account

When the company decides that a specific customer is never going to pay his bill, Accounts Receivable is reduced by the amount he owes and a corresponding reduction is made in the Allowance for Doubtful Accounts. This entry is made whenever the fact of the bad debt loss is recognized, which may be either during the accounting period or at the end of the period. This transaction has *no* effect on Bad Debt Expense. For example, if sometime in 1956 the Essel Company decided that John Jones was never going to pay his bill of $200, the following entry would be made:

dr. Allowance for Doubtful Account	200	
cr. Accounts Receivable		200

A balance sheet prepared immediately after this transaction had been recorded (assuming no other changes since December 31) would appear as follows:

Accounts receivable	$299,800
Less: Allowance for doubtful accounts	5,800
Accounts Receivable, Net	$294,000

Note that the *net* amount of accounts receivable is unchanged by this transaction.

Collection of a Bad Debt Written Off

If, by some unexpected turn of good fortune, John Jones should subsequently pay all or part of his bill, cash would be increased (i.e., debited) and a corresponding credit would be recorded to have one of the following effects:

1. Increase retained earnings on the balance sheet.
2. Add the amount back to allowance for doubtful accounts on the balance sheet; i.e., "reverse" the previous entry.
3. Show as bad debts recovered, a separate item of revenue on the income statement;
4. Decrease bad debt expense on the income statement.

The first method is theoretically sound, but it ordinarily is not used since it goes counter to the "clean surplus" doctrine. The second method is also theoretically sound, and it is often used. The third method is rarely used because the amount involved is usually too small to warrant reporting it as a separate item. The fourth method is not entirely logical but is often used in practice since it provides a convenient way of handling the transaction.

The allowance for doubtful accounts should be sufficient at all times to absorb the accounts that prove to be uncollectible. Because the amount so established is an *average* based on past experience, and because business conditions fluctuate, the amount will turn out to be too large in some periods and too small in others. In practice, it is more common to find that the allowance is too large rather than too small. On the other hand, especially in small companies, there are some cases where the allowance for doubtful accounts proves to be inadequate.

Summary

Let us summarize the handling of events described above by showing the effect of hypothetical transactions in 1956 on the Essel Company accounts:

1. *Write-off of $5,000 more of bad debts during the year:*

dr. Allowance for Doubtful Accounts	5,000	
cr. Accounts Receivable		5,000

The balance in Allowance for Doubtful Accounts becomes $800.

2. *Recovery of $500 previously written off:*

dr. Cash	500	
cr. Allowance for Doubtful Accounts*		500

The balance in Allowance for Doubtful Accounts becomes $1,300.

3. *Adjustments at end of 1956,* assuming allowance is to be maintained at 2 per cent of accounts receivable, which are, say, $400,000 as of December 31, 1956:

dr. Bad Debt Expense	6,700	
cr. Allowance for Doubtful Accounts		6,700

This brings the allowance up to $8,000 which is 2 per cent of accounts receivable.

FIXED ASSETS AND DEPRECIATION

The Acquisition of Fixed Assets

In accordance with the basic accounting concept of value, fixed assets are initially recorded on the books at their cost to the company. On this subject, the American Accounting Association Committee states:

> The most commonly useful financial statements report the origin and disposition of the assets of an enterprise in terms of costs established and recorded at the time the assets are acquired. The importance of costs as a record of the accountability of an enterprise for its resources makes it essential that their determination be based on available objective evidence. When an asset is *purchased,* such evidence is found in the cash outlay, in the fair market value of any noncash consideration, or, in the absence of those measures of cost, in the fair market value of the asset acquired.[1]

In a great many cases, this cost is easily determined. The cost of a truck, for example is usually the price shown on the invoice. The term "cost" is usually interpreted as meaning cost *installed and ready to*

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* As mentioned before this is only one of several possible treatments.

[1] "Accounting Concepts and Standards Underlying Corporate Financial Statements," 1948 Revision, *The Accounting Review,* October, 1948, p. 340.

operate, so that in the case of machinery, shipping costs and the costs of making the installation are usually included as part of the cost of the asset. When the company constructs a machine or a building with its own personnel, the cost of the asset includes all the costs incurred in construction. If the cost of building a machine is unreasonably high (such as would be the case if the machine were an experimental model and required a considerable amount of development work), the doctrine of conservatism dictates that the asset be "booked" (i.e., recorded in the accounts) at a figure equal to the purchase price of a similar machine from an outside vendor or equal to the cost of building a duplicate machine if the "trial and error" cost involved in building the original machine could be avoided.

Occasionally a company acquires a fixed asset that is obviously worth significantly more than the amount paid for it. Such transactions are called *"fortunate acquisitions."* They happen, for example, when a city provides a building at no cost or at only a nominal cost in order to induce a company to locate there, or when valuable minerals are discovered on land that was acquired at low cost. Under such circumstances, the principle that value is equated to cost is frequently not followed, and the asset is recorded at an estimate of its current value. The difference between this recorded value and cost is credited to owners' equity.

Betterments versus Maintenance

Repair and maintenance work is that work done to keep the asset in good operating condition or to bring it back to good operating condition if it has broken down. Repair and maintenance is ordinarily an expense of the accounting period in which it is done; it is not added to the cost of the fixed asset.

A betterment *is* added to the cost of .the asset. The distinction between maintenance expenses and betterments is simple to state: maintenance work keeps the machine in good condition but in no better condition than when it was purchased; a betterment makes the machine better than it was when it was purchased. In practice, the line between the two is difficult to draw, and in the interests of conservatism some work, which strictly speaking may be considered as a betterment, is charged as an expense of the current period.

Depreciation

With the exception of land, most fixed assets have a limited useful life; that is, they will be of use to the company over a finite number of future accounting periods. The cost of the asset is properly chargeable as an expense in the accounting periods in which the asset is used by the company. The accounting process for this gradual conversion of fixed assets into expense is called *depreciation*. It is described as follows by the American Institute of Accountants Committee:

> The cost of a productive facility is one of the costs of the service it renders during its useful economic life. Generally accepted accounting principles require that this cost be spread over the expected useful life of the facility in such a way as to allocate it as equitably as possible to the periods during which services are obtained from the use of the facility. This procedure is known as depreciation accounting, a system of accounting which aims to distribute the cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation.[2]

The question is sometimes asked: Why is depreciation an expense? The answer is that, as explained in Chapter 4, *all* goods and services consumed by a business during an accounting period are expenses. The cost of insurance protection provided in a year is an expense of that year even though the insurance premium was paid two or three years previously. Depreciation expense is like insurance expense except that the fraction of total cost of a fixed asset that is an expense in a given year is difficult to estimate, whereas the fraction of the total cost of an insurance policy that is an expense in a given year can be easily calculated. This difference does not change the fundamental fact that both insurance policies and fixed assets provide service to the company over a *finite* number of accounting periods and must therefore be charged as expenses of these periods.

Depreciation Methods

Judgments Required. In order to determine the depreciation expense for an accounting period, three judgments or estimates must be made for each fixed asset:

1. The *life* of the asset; i.e., over what period of time will it be useful to the company? This estimate is based on experience with similar assets, or on published estimates (such as *Bulletin "F"* of the Internal Revenue Service, which gives estimated life for a wide variety of assets), or on the opinion of engineers, or on sheer guesswork.

2. *Salvage or resale value* at the end if its life. The net cost of the asset to the company is its original cost less any amount eventually recovered through sale or salvage, and it is this net cost that should be

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[2] American Institute of Accountants, *Accounting Research Bulletin No. 43,* p. 76.

charged as an expense over the asset's life. In a great many situations, however, the estimated salvage or resale value is so uncertain that it is disregarded.

3. *The method of depreciation;* i.e., the formula that will be used to allocate a fraction of the net cost to each of the accounting periods in which the asset is expected to be used.

Note that businessmen, not being clairvoyant, cannot *know* in advance how long the asset will last or what its salvage value, if any, will be; and they usually have no scientific or strictly logical way of deciding the best depreciation method. The figure of depreciation expense that results from all these judgments is therefore an estimate, and often it is only a rough estimate.

To illustrate the accounting entries involved, let us assume that on December 31, 1942, the Trantor Company acquired a building for which it paid $100,000 cash. The entry to record the acquisition would be:

dr. Building	100,000	
cr. Cash		100,000

Its balance sheet on that date would contain the item, "Building, $100,000." Assuming that no salvage value is anticipated, the problem of depreciation accounting is to charge this $100,000 as an expense to the accounting periods during which the building will be used.

The practice followed by most companies is to estimate the number of years that the building will last and then to charge a pro rata share of the cost to each of these periods. This is the so-called *straight-line method* of depreciation. If the Trantor Company estimates that its building will last forty years, 1/40 of the cost of $100,000 will be the depreciation expense of 1943, another 1/40 will be the depreciation expense in 1944, and so on.

Two other methods of depreciation are worth noting: the declining-balance method and the years-digits method. Neither was used extensively prior to 1954, but their popularity is increasing because the 1954 Internal Revenue Act permits their use for income tax purposes. The effect of these methods is to write off a large fraction of the cost of the asset in the early years of its life and a smaller fraction in later years. Under either of these methods approximately two thirds of the cost is written off in the first half of the asset's estimated life, as contrasted with the straight-line method under which, of course, half the cost is written off in each half of the asset's estimated life.

In the *declining-balance method,* the depreciation for each year is found by applying a rate to the book value of the asset at the beginning of that year rather than to the original cost of the asset. *Book value* is cost less total depreciation accumulated up to that time. If the declining balance method is used, the new tax law permits the company to take *double* the rate allowed under the straight-line method.

In the *years-digits method,* the numbers 1, 2, 3 . . . n are added, where n is the estimated years of useful life. The depreciation rate each year is a fraction in which the denominator is the sum of these digits and the numerator is, for the first year, n; for the second year, n-1; for the third year n-2, and so on. Assume, for example, a machine with an estimated life of ten years. The sum of the numbers 1, 2, 3 . . . 10 is 55. Depreciation in the first year would be $^{10}/_{55}$ of the cost; in the second year $^{9}/_{55}$; in the third year $^{8}/_{55}$, and so on.

Illustration 6–1 is an example of the way these three methods work out for a machine costing $1,000 with an estimated life of ten years and no salvage value.

Illustration 6–1

Year	Straight-Line (10% Rate)		Declining-Balance (20% Rate)		Years-Digits		
	Book Value, 12/31	Annual Depreciation	Book Value, 12/31	Annual Depreciation	Rate	Book Value, 12/31	Annual Depreciation
0.	$1,000	$ . . .	$1,000.00	$	. . . .	$1,000.00	$ . . . . .
First.	900	100	800.00	200.00	10/55	818.18	181.82
Second.	800	100	640.00	160.00	9/55	654.54	163.64
Third.	700	100	512.00	128.00	8/55	509.09	145.45
Fourth.	600	100	409.60	102.40	7/55	381.82	127.27
Fifth.	500	100	327.68	81.92	6/55	272.73	109.09
Sixth.	400	100	262.14	65.54	5/55	181.82	90.91
Seventh.	300	100	209.71	52.43	4/55	109.09	72.73
Eighth.	200	100	167.77	41.94	3/55	54.54	54.55
Ninth.	100	100	134.22	33.55	2/55	18.18	36.36
Tenth.	0	100	107.38	26.84	1/55	0	18.18
Eleventh.	. . . .	. . .	85.90	21.48	. . . .	. . . . .	. . . . .
Twelfth.	. . . .	. . .	68.72*	17.18	. . . .	. . . . .	. . . . .
		$1,000		$931.28*			$1,000.00

* Under the strict declining-balance method, depreciation continues until the asset is disposed of; for, until then, the cost is never completely written off. Many companies, however, switch from the declining-balance method to the straight-line method in the later years of life, and thus write off the entire cost in a specified number of years. This is permitted for tax purposes.

Finally, mention is made of the *units-of-production* method, under which depreciation is charged at a certain amount per unit produced in the accounting period. If a truck has an estimated net cost of $3,000 and is expected to give service for 60,000 miles, depreciation could be charged at a rate of $0.05 per mile, the depreciation expense in a year in which the truck traveled 20,000 miles being $1,000. While this method has much in theory to commend it, as a practical matter there is great difficulty in estimating the total amount of production that will be turned out by most types of assets during their useful life. The units-of-production method is therefore not as widely used, in practice, as the methods that specify a certain depreciation charge for each time period.

Accounting for Depreciation

Referring back to the building purchased on December 31, 1942, by the Trantor Company for $100,000, and assuming that this building is to be depreciated on a straight-line basis over forty years, that is, $2,500 per year, let us now consider how to record this depreciation on the accounting records. It would be possible to reduce the asset value by $2,500 a year and to show on the balance sheet only the remaining amount, which at the end of 1943 would be $97,500; but this is *not* ordinarily done. Instead, a special item is shown on the balance sheet for the accumulated amount of depreciation. This item may be called *accumulated depreciation,* or it may have some other name such as "allowance for depreciation," "reserve for depreciation," and so on. (The last term is another example of a misleading use of the word "reserve"; the depreciation process does not "reserve" money or anything else.) Both the original cost and the accumulated depreciation figures appear on the balance sheet. The figures as of December 31, 1943, would look like this:

Building	$100,000
Less: Accumulated depreciation	2,500
Net	$ 97,500

As of December 31, 1944, another year's depreciation would be added, and the balance sheet would then show:

Building	$100,000
Less: Accumulated depreciation	5,000
Net	$ 95,000

The foregoing figures can be interpreted as follows:

Original cost of the building	$100,000
That portion of the cost charged to operations for all periods to date	5,000
That portion of the cost remaining to be charged to operations of future periods	$ 95,000

A few companies report accumulated depreciation on the right-hand, or equities, side of the balance sheet rather than as a subtraction from the appropriate asset account.

On the income statement, the expense item is usually labeled *depreciation expense.* In the income statement for 1943, this item for the Trantor Company would be $2,500 (disregarding depreciation on assets other than the building we are considering), and this same amount would appear in the income statement for 1944, 1945, and following years until either the building was disposed of or until it was fully depreciated. Usually, the Depreciation Expense account includes depreciation for all types of fixed assets, but there must be a separate Accumulated Depreciation account for each category of fixed assets (building, machinery, office equipment, etc.) shown separately on the balance sheet.

The annual journal entry, which is one of the adjusting entries, would therefore be:

dr. Depreciation Expense	2,500	
cr. Accumulated Depreciation, Building		2,500

If the Trantor Company should use its building for more than forty years, depreciation would cease to be accumulated at the end of the fortieth year, since by then the total cost of the building would have been charged to expense. Until the asset is disposed of, it is customary to continue to show the asset on the balance sheet. Thus, from December 31, 1982, onward, the balance sheet would show:

Building	$100,000
Less: Accumulated depreciation	100,000
Net	0

The foregoing estimates of depreciation pertained to a single fixed asset, one building. The depreciation expense for each asset could be estimated in a similar manner, and the total expense for an entire category of assets recorded by one journal entry. This is the procedure used in many businesses. An alternative procedure is called *composite* depreciation. In this procedure, an average depreciation figure is calculated for a whole group of assets even though these assets may have been purchased at different times and may have different useful lives. The details of this procedure may be found in most accounting texts or handbooks; the basic concept is the same as that already described.

Write-Off of Fixed Assets

Suppose at the end of ten years the Trantor Company sells its building. At that time $^{10}/_{40}$ of the original cost, or $25,000, will have been built up in the Accumulated Depreciation account, and the net book value of the building will be $75,000. If the building is sold for $75,000 cash, the accounts are changed, as follows: Cash is increased by $75,000; the Building account is decreased by $100,000, and Accumulated Depreciation is decreased by $25,000, which is the amount of depreciation accumulated up to that time. The entry is as follows:

dr. Cash	75,000	
Accumulated Depreciation	25,000	
cr. Building		100,000

This has the effect of eliminating from the accounts both the original cost of the building and the accumulated depreciation thereon.

If the building were sold for less than $75,000, say $65,000, the transaction would be recorded as follows: Cash is increased by $65,000, the Building account is decreased by $100,000, Accumulated Depreciation is decreased by $25,000, and Retained Earnings or some other owners' equity account is decreased by $10,000, as in the following journal entry:

dr. Cash	65,000	
Accumulated Depreciation	25,000	
Retained Earnings	10,000	
cr. Building		100,000

Note that the effect on the Building and Accumulated Depreciation items is identical with that in the previous illustration. The decrease in Retained Earnings reflects the fact that the depreciation expense for the preceding ten years was less than what we now know to have been the actual net cost of the building over that period of time. The actual cost turns out to be $35,000, whereas the total depreciation expense charged against earnings has amounted to only $25,000. Thus, the depreciation expense as originally recorded turns out to have been incorrect, and the Retained Earnings account, which reflects the net of all revenue and expenses, was also incorrect. This error is corrected by decreasing Retained Earnings by $10,000.

Since the error occurred in prior years, it can be argued logically that the correction should be made directly to Retained Earnings and that the income statement for the current accounting period should not be affected. Many companies, however, choose to show this item on the current income statement in accordance with the "clean surplus" doctrine mentioned in Chapter 4. In this case, the amount is shown as "loss (or gain) on the sale of fixed assets" in the nonoperating expense (or revenue) portion of the statement.

Funding Depreciation

The amount shown as accumulated depreciation on the balance sheet does not represent cash or any tangible asset; it is merely that portion of the assets' original cost that has been already charged off against income. Thus, the notion that this figure represents an amount of money that can be used to purchase new assets—which is a fairly common belief—is incorrect.

Occasionally a company does set aside money for the specific purpose of purchasing new assets, and this process is sometimes called "funding depreciation." This transaction is completely separate from the depreciation mechanism described above. If depreciation is funded, cash or securities are physically segregated; that is, they are set aside in such a way that they cannot be used in the regular operation of the business (for example, a special bank account may be created). This fact is reflected on the balance sheet by an asset titled "new building fund," or some similar name, the offsetting entry being a credit to Cash. This practice is not common and is mentioned here only to emphasize, by contrast, the point that the depreciation process itself is *not* a means of automatically creating a fund for the replacement of assets.

The Nature of Depreciation

The key to a practical understanding of depreciation is: *Depreciation is a process of allocation, not of valuation.* Depreciation expense does not represent the shrinkage in real value during an accounting period; physically, the machine may be as useful and as valuable at the end of the period as at the beginning of the period. Neither does the net book value represent the real value, or the market value, or the remaining value in use of the assets on hand. Depreciation expense is a write-off of a portion of the cost of the asset, and it follows that the net book value of fixed assets reported on the balance represents one thing and one thing only; namely, that portion of the original cost of the fixed asset which has *not yet* been charged to expense.

Although the foregoing is adequate for a practical understanding of the depreciation figures appearing on financial statements, it should perhaps be pointed out that a considerable body of theory exists for those who wish to penetrate deeper into the subject. One of the most interesting theories considers a fixed asset to be not simply a building or a machine but rather a bundle of service units. In this "bundle of services" approach, depreciation expense is an estimate of the value of those service units that were consumed in the current period and the book value of the asset is an estimate of the value of those service units that are still on hand. For reasons that need not be listed here, this approach gives strong support to the declining-balance or years-digits methods now approved for income tax purposes. Another approach will be found in the U.S. Steel Corporation case, page 251.

Although a study of these theories can be rewarding, the theories should not be permitted to obscure the basic practical fact that no one really knows how long an asset will last or what its residual value will be at the end of its life. Without this knowledge, the depreciation figure is necessarily an estimate. Because of the uncertainties inherent in this estimate, the great majority of businesses do not pay much attention to theoretical considerations in selecting their depreciation methods. Instead, they choose a method which is easy to use, which writes off the original cost in some systematic fashion over the asset's estimated useful life, and which is believed to be most advantageous for income tax purposes.

INTANGIBLE ASSETS

Intangible long-lived assets, such as goodwill, organization expense (i.e., cost incurred to get a business started), trademarks, and patents are usually converted to expenses over a number of accounting periods. The periodic write-off is called *amortization.* The "amortization" of intangible assets is essentially the same process as the "depreciation" of tangible assets.

The American Institute of Accountants Committee suggests that these intangibles be classified into two categories:

> (a) Those having a term of existence limited by law, regulation, or agreement, or by their nature (such as patents, copyrights, leases, licenses, franchises for a fixed term, and goodwill as to which there is evidence of limited duration);
>
> (b) Those having no such limited term of existence and as to which there is, at the time of acquisition, no indication of limited life (such as goodwill generally, going value, trade names, secret processes, subscription lists, perpetual franchises, and organization costs).[3]

The treatment recommended for each category is as follows:

> The cost of the type (a) intangibles should be amortized by systematic charges in the income statement over the period benefited, as in the case of other assets having a limited period of usefulness. If it becomes evident that the period benefited will be longer or shorter than originally estimated, recognition thereof may take the form of an appropriate decrease or increase in the rate of amortization or, if such increased charges would result in distortion of income, a partial write-down may be made by a charge to retained earnings.
>
> When it becomes reasonably evident that the term of existence of a type (b) intangible has become limited and that it has therefore become a type (a) intangible, its cost should be amortized by systematic charges in the income statement over the estimated remaining period of usefulness.[4]

Although the above statement does not imply such a treatment, many companies *do* write off "type (*b*)" intangibles (those that do not have a definitely limited life) over one or more accounting periods. There is, by definition, no logical way of determining over how many periods such assets should be written off. In some cases, they are written off as an expense in the year of *acquisition.* Other companies choose to write them off over some fairly short period, such as five or ten years, with the choice of the time period depending pretty much on how much the income statement can stand; that is, how much can be charged off each year without having a serious impact on reported net income.

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[3] American Institute of Accountants, *Accounting Research Bulletin No. 13,* p. 37.

[4] *Ibid.,* p. 38.

In the case of "type (*a*)" intangibles, it should be pointed out that their *useful* life may be shorter than their legal life; if so, the asset is written off over the shorter period. For example, although a patent is legally valid for seventeen years, the company may decide that technological change or other forces may make it obsolete within a shorter period of time; if such is the case, the patent may be written off over fifteen years, ten years, or whatever period the company decides the asset will be useful.

CASES

CASE 6–1. MASSASOIT TRUST COMPANY

The Massasoit Trust Company conducted a commercial banking business in a city of approximately 100,000. The company did not own its banking quarters but operated under a lease which still had five years to run in 1950. While the lease contained no renewal provisions, the bank had occupied the building since 1905 under successive ten-year leases. Relations with the owner of the building, who was also the operator of a nearby department store, continued to be cordial. The lease provided, however, that the owner could cancel the lease on two years' notice if he required the property for his own business.

In the spring of 1950, the directors of the bank were considering a proposal to remodel and air condition the bank quarters. The bank had received firm bids from contractors on the work to be done, and these totaled approximately $63,000.

In the course of the discussion, a debate arose over the way in which the expenditure would be carried in the bank's books. One of the directors favored carrying the improvement as an asset and depreciating it over its physical life, which he estimated at about twenty-five years.

Several directors objected to this procedure. Under the so-called "rule of fixtures," which was a well-established legal principle, permanent improvements to leased property were generally considered to be the property of the owner of the real estate. Since the bank did not own the property, these directors did not think the improvements should be considered as an asset. They favored charging the entire cost of the improvements as an expense in the current year, which had been the procedure with minor renovation expenses in the past.

Other directors felt that capitalizing the expenditure would be acceptable, but they did not think it wise to adopt a depreciation period longer than the life of the lease. They also wondered what consideration should be given to the two-year cancellation provision.

The first director was not convinced by either of these approaches. He said he would not favor the remodeling project were he not convinced that the lease would be renewed as it had been in the past. He was also disturbed about the effect that a rapid write-off might have on the bank's earnings.

In 1949, the Massasoit Trust Company had a gross revenue of $285,000, including $205,000 in income from loans, discounts, and investments in securities. After operating expenses but before income taxes, earnings were approximately $70,000. Federal income taxes amounted to about $20,000. The operating expenses were largely of a fixed nature.

The bank's statement of condition as of December 31, 1949, is given in Exhibit 1. According to the state banking law, trust companies could accept deposits of up to ten times the amount of their capital and surplus. The law also required 15 per cent of deposits to be maintained as a cash reserve; the balance could be used for loans, discounts, and investments in United States government and other securities. The bank

Exhibit 1

MASSASOIT TRUST COMPANY

Statement of Condition, December 31, 1949
(Thousands of Dollars)

RESOURCES:		
Cash on hand and in banks		$ 2,464
U.S. government securities		6,886
Other securities		275
Loans and discounts		2,587
Other assets		42
		$12,254
LIABILITIES:		
Commercial deposits		$ 8,667
Savings deposits		2,402
Total Deposits		$11,069
Reserve for taxes, etc.		61
Capital stock	$350	
Surplus	774	1,124
		$12,254

was not permitted to loan an amount greater than 20 per cent of its capital stock and surplus to any one individual or firm.

Questions

1. Why should the directors be concerned about this problem?
2. What action do you recommend?

CASE 6–2. BRAZOS PRINTING COMPANY

The Brazos Printing Company was founded in 1940 as a one-man job printing firm in a small southwestern town. Shortly after its founding, the owner decided to concentrate on one specialty line of printing. Because of a high degree of technical proficiency, the company experienced a rapid growth.

However, the company suffered from a competitive disadvantage in that the major market for its specialized output was in a metropolitan area over 300 miles away from the company's plant. For this reason, the owner, in 1952, decided to move nearer his primary market. He also decided to expand and modernize his facilities at the time of the move. After some investigation, an attractive site was found in a suburb of his primary market, and the move was made.

A balance sheet prepared prior to the move is shown in Exhibit 1.

Exhibit 1

BRAZOS PRINTING COMPANY

Condensed Balance Sheet

ASSETS			EQUITIES	
Current Assets:			Current liabilities	$ 41,346
Cash		$ 91,242	Common stock	100,000
Other current assets		69,720	Retained earnings	79,098
Total Current Assets		$160,962		
Fixed Assets:				
Land		5,000		
Buildings	$76,000			
Less: Accumulated depreciation	45,000	31,000		
Equipment	$65,822			
Less: Accumulated depreciation	42,340	23,482		
Total Assets		$220,444	Total Equities	$220,444

The transactions that arose from this move are described in the following paragraphs:

1. The land at the old site together with the building thereon was sold for $35,000. The land had originally cost $5,000. The building appeared on the company's books at a cost of $76,000, and a depreciation allowance of $45,000 had been accumulated on it.

2. Certain equipment was sold for $4,500 cash. This equipment appeared on the books at a cost of $16,700 less accumulated depreciation of $9,700.
3. New bindery equipment was purchased. The invoice cost of this equipment was $20,000. A 2 per cent cash discount was taken by the Brazos Company, so that only $19,600 was actually paid to the seller. The Brazos Company also paid $80 to a trucker to have this equipment delivered. Installation of this equipment was made by Brazos workmen who worked a total of forty hours. These men received $1.50 per hour in wages, but their time was ordinarily charged to printing jobs at $4.00 per hour, the difference representing an allowance for overhead ($2.10) and profit ($0.40).
4. The city to which the company moved furnished the land on which the new plant was built as a gift. The land had an appraised value of $20,000; the appraisal had been made recently by a qualified appraiser. The company would pay property taxes on its assessed value, which was $15,000.
5. The Brazos Company paid $4,000 to have an old building on the gift plot of land torn down. (The value of this building was not included in the appraised or assessed values named above.) In addition, the company paid $2,000 to have permanent drainage facilities installed on the new land.
6. A new strip caster with an invoice cost of $4,500 was purchased. The company paid $3,000 cash and received a trade-in allowance of $1,500 on a used strip caster. The used strip caster could have been sold outright for not more than $1,200. It had cost $3,000 new, and accumulated depreciation on it was $1,200.
7. The company erected a building at the new site for $90,000. Of this amount $70,000 was borrowed on a mortgage.
8. After the equipment had been moved to the new plant, but before operations began there, extensive repairs and replacement of parts were made on a large paper cutter. The cost of this work was $1,100. Prior to this time, no more than $100 had been spent in any one year on the maintenance of this paper cutter.
9. Trucking and other costs associated with moving equipment to the new location and installing it were $1,400. In addition, Brazos Company employees worked an estimated 120 hours on that part of the move that related to equipment.
10. During the moving operation, a piece of equipment costing $3,000 was dropped and damaged. $400 was spent to repair it. The management believed, however, that the salvage value of this equipment had been reduced to $200. Up until that time, the equipment was being depreciated at $240 per year, representing a 10 per cent rate after deduction of estimated salvage of $600. Accumulated depreciation was $960.

Question

1. Analyze the effect of these transactions on the items in the balance sheet. For transactions that affect owners' equity, distinguish between those that affect the net profit of the current year and those that do not.

Chapter

7

THE INCOME STATEMENT OF MANUFACTURING COMPANIES

Because manufacturing companies perform different functions from those performed by merchandise trading companies (e.g., retail stores, wholesalers, distributors), there is an important distinction between methods of accounting for the cost of goods sold in the two types of companies. The major function of a merchandising firm is the distribution of finished goods. In this type of company, as described in a previous chapter, accounting for the cost of goods sold involves a consideration of the beginning and ending inventories and of the purchases account. On the other hand, a manufacturing company has as a major function the conversion of raw materials into finished goods. In any company, cost of sales is the total of the purchase price and conversion costs, if any, of the products that are sold. The manufacturer, therefore, includes in cost of goods sold the cost of raw material used, the cost of labor, and other costs incurred in the manufacture of the goods that are sold. The difference, then, between accounting for the cost of sales in a merchandising company and in a manufacturing company arises because the merchandising company usually has no conversion costs; thus, its cost of sales is practically the same as the price that the company paid for the products that it sells.

Both manufacturing and merchandising companies usually have general and administrative expenses. Generally, the manufacturer is also a merchandiser and incurs selling expenses in disposing of his goods. These selling expenses, along with general and administrative and financial costs, are recorded on the income statement of a manufacturing company in the same manner as in a merchandising firm, that is, below the gross profit figure.

Illustrations 7–1 and 7–2 are examples of income statements for a merchandising firm and for a manufacturing firm; they illustrate the differences between the two kinds of statements.

Illustration 7–1

MALONE STORES, INCORPORATED

Income Statement for Year Ending December 31, 1955

Net sales			$666,720
Cost of goods sold:			
Beginning inventory, 1/1/55		$184,350	
Merchandise purchases	$454,920		
Freight and drayage	30,210	485,130	
Cost of goods available for sale		$669,480	
Less: Ending inventory, 12/31/55		193,710	
Cost of goods sold			475,770
Gross margin			$190,950
Selling, administrative, and general expenses:			
Salaries and wages		$ 88,170	
Rent		24,390	
Light, heat, and power		8,840	
Other		21,300	
State and local taxes and licenses		5,130	
Depreciation and amortization on leasehold improvements		4,140	
Repairs		2,110	154,080
Profit from operations			$ 36,870
Other revenue		$ 7,550	
Other expense		1,740	5,810
Net profit before taxes			$ 42,680
Provision for income tax			15,120
Net Profit			$ 27,560

ACCOUNTING FOR THE COST OF GOODS SOLD

Manufacturing costs are ordinarily classified into three general categories: raw materials, direct labor, and manufacturing overhead. A manufacturing company typically has three types of inventory: raw materials, goods in process, and finished goods. Each of these cost and inventory items will be examined in turn to show their relationship to each other and their part in determining cost of goods sold.

The accounting procedure described below traces the process of accounting for cost of goods sold using figures shown on the income statement in Illustration 7–2. In the procedure to be described, all accounts associated with the manufacturing process are closed at the end of the operating period directly to Cost of Goods Sold. Some businesses follow a more elaborate closing procedure in which additional accounts corresponding to certain income statement items, such as Cost of Material Used and Cost of Goods Manufactured (see Illustration 7–2), are employed. Successive closings are made to these accounts. Such a closing procedure, however, has the same ultimate effect as direct closing to Cost of Goods Sold. Still other companies trace the flow of costs through the factory by means of a cost accounting system. Such a system can

Illustration 7–2

ALFMAN MANUFACTURING COMPANY

Income Statement for Year Ending December 31, 1955

Net sales				$669,100
Cost of goods sold:				
Raw materials cost:				
Raw materials inventory, 1/1/55		$154,300		
Purchases	$263,520			
Plus: Freight-in	9,400			
Total Purchases		272,920		
Total Inventory and Purchases		$427,220		
Less: Raw materials inventory, 12/31/55		163,120		
Cost of materials used			$264,100	
Direct labor cost			150,650	
Manufacturing overhead cost:				
Indirect labor		$ 23,750		
Factory heat, light, and power		89,500		
Factory supplies used		22,100		
Insurance and taxes		8,100		
Depreciation—plant and equipment		35,300		
Total Manufacturing Overhead Cost			178,750	
Total Manufacturing Costs			$593,500	
Add: Goods in process inventory, 1/1/55			18,800	
Total			$612,300	
Less: Goods in process inventory, 12/31/55			42,600	
Cost of goods manufactured			$569,700	
Add: Finished goods inventory, 1/1/55			69,200	
Cost of goods available for sale			$638,900	
Less: Finished goods inventory, 12/31/55			66,400	
Cost of goods sold				572,500
Gross profit				$ 96,600
Selling and administrative expenses:				
Selling expense			$ 38,500	
Depreciation—selling			3,200	
Administrative expense			32,200	73,900
Net operating profit				$ 22,700
Other revenue				15,300
Net profit before taxes				$ 38,000
Provision for income tax				12,640
Net Profit				$ 25,360

produce the cost of goods sold directly, i.e., without the necessity of taking the periodic inventories that are required for the procedure described in this chapter. A discussion of the cost accounting method is deferred to Chapter 10.

Raw Materials

Raw materials (sometimes called "stores") are those materials which actually enter into and become part of the finished product. They are to be distinguished from supplies, which are materials used in the operation of the factory but not directly in the product itself. Raw materials are accounted for in much the same manner as are finished goods in a merchandising concern; that is, there is an account in which beginning and ending inventories are entered and another account for purchases during the period. In addition, there are the accounts associated with purchases, such as Purchase Returns and Allowances, Purchase Discounts, and Freight-In; the balances shown in these accounts are usually added to or subtracted from Purchases in order to determine the net amount expended for raw materials during the period.

The total *cost of raw material used* in a period consists of the cost of raw materials on hand at the beginning of the period (as shown in the Raw Materials Inventory account), plus the net amount expended for the purchase of additional raw materials during the period, less the cost of the raw materials on hand at the end of the period. (This calculation is illustrated by the figures that give the Cost of Materials Used as $264,100 in Illustration 7–2.)

The cost of raw materials used is in effect determined by the process of deduction; that is, it is assumed that the amount of raw material used is the difference between the materials available for use during the period (which is the total of the beginning inventory and the net purchases) and the ending inventory. This assumption does not take into account any waste or spoilage of material that might have occurred. In practice waste and spoilage is either disregarded or is collected separately and removed from material costs by crediting beginning Raw Material Inventory and debiting a manufacturing expense account.

An illustration of the manner in which the accounts relating to materials may be closed to Cost of Goods Sold at the end of an operating period is as follows:

(1)		
dr. Cost of Goods Sold	154,300	
cr. Raw Materials Inventory		154,300
To close the beginning inventory.		
(2)		
dr. Cost of Goods Sold	272,920	
cr. Purchases		263,520
Freight-In		9,400
To close purchasing accounts.		
(3)		
dr. Raw Materials Inventory	163,120	
cr. Cost of Goods Sold		163,120
To enter the ending inventory.		

Direct Labor

A second element of manufacturing cost is direct labor. Direct labor is applied to convert raw material into the finished product. Direct labor costs are those which can be specifically identified with the unit of product or which vary so closely with the number of units produced that a direct relationship is presumed to be present. The wages of workers who assemble parts into a finished product, or who operate machines in the process of production, or who work on the product with tools, would be considered as direct labor cost. The total direct labor cost for the period is, along with the cost of raw materials used, another part of the total manufacturing costs for the period. The accounting entry that records this fact is:

dr. Cost of Goods Sold	150,650	
cr. Direct Labor		150,650

Manufacturing Overhead

The third category of manufacturing costs is manufacturing overhead, sometimes termed "manufacturing expense," "burden," or, simply, "overhead." Manufacturing overhead includes all costs other than raw materials and direct labor which are associated with the manufacture of the product. One overhead element is indirect labor, which represents wages and salaries earned by employees such as foremen, truckmen, and janitors, who do not work directly on the product itself but whose services are related to the process of production. In addition, manufacturing overhead includes such costs as depreciation of plant and equipment, heat, light, power, maintenance, supplies, and taxes and insurance on the assets used in the manufacturing process.

These costs, like direct material and direct labor, also are part of the manufacturing costs for the period and are closed to Cost of Goods Sold at the end of the accounting period as follows:

dr. Cost of Goods Sold	178,750	
cr. Indirect Labor		23,750
Factory Heat, Light, and Power		89,500
Factory Supplies Used		22,100
Insurance and Taxes		8,100
Depreciation—Plant and Equipment		35,300

Product Costs and Period Costs. In practice, many questions arise as to whether a certain element of cost should be considered as a manufacturing cost and hence included as part of the value of the products manufactured, or whether it should be considered as one of the general, administrative, and selling costs. Costs that are included in the value of the product are called *product* costs; other costs are called *period* costs. There is considerable disagreement among accountants as to where the line between these two types of costs should be drawn. In many companies the general practice is to consider that raw material, direct labor, and all other costs associated with the manufacturing process are product costs and therefore a part of the inventory valuation of the product. Some companies, however, use a method called "direct costing" in which only direct material, direct labor, and the variable portion of manufacturing overhead are considered as part of the cost of the product for inventory purposes.[1]

Even among companies that use "full costs" rather than "direct costs" in inventory, there is no agreement as to what elements of cost should be included. Some companies include the cost of such functions as personnel and industrial relations, public relations, legal, plant protection, accounting, financial management, and general administration in manufacturing overhead; other companies include part of the cost of some or all of these functions; and still others exclude all of them.

Goods in Process

Goods in process (sometimes called *work in process*) consist of those unfinished goods which are currently in some stage of the manufacturing process. A Goods in Process Inventory account usually appears on the books of a manufacturing company. It shows the cost of the goods in process as of any balance sheet date. This cost includes the raw material, direct labor, and manufacturing overhead which have been applied to the production of units that have been started through the factory but that have not been completed by the end of the accounting period. Methods of assigning these costs to the specific units of product in process are described in Chapter 10.

To determine the *cost of goods manufactured* (see Illustration 7–2) during a period, the total manufacturing costs of the period (i.e., raw materials used, direct labor, and manufacturing overhead) are added to the cost of goods in process at the beginning of the period, and the cost of goods in process at the end of the period is then subtracted. In the accounts, the cost of goods manufactured is derived by closing manufacturing costs to Cost of Goods Sold, as already described in the preceding section and, in addition, by closing the cost of goods in process at the beginning of the period (as shown by the Goods in Process Inventory account) into Cost of Goods Sold, and setting up in this same inventory account the cost of the goods in process at the end of the period. The entries required to accomplish this, in addition to those already given, are as follows:

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[1] But the omission of *all* overhead costs from inventory is not now an accepted practice. See American Institute of Accountants, *Accounting Research Bulletin No. 43,* p. 29: ". . . under certain circumstances, items such as idle factory expense, excessive spoilage, double freight, and rehandling costs may be so abnormal as to require treatment as current period charges, except for the portion of such expenses that may be clearly related to production and thus constitute a part of inventory costs (product charges). Selling expenses constitute no part of inventory costs. *It should also be recognized that the exclusion of all overheads from inventory costs does not constitute an accepted accounting procedure."* (Emphasis supplied.)

dr. Cost of Goods Sold	18,800	
cr. Goods in Process Inventory		18,800
To close the beginning inventory.		

dr. Goods in Process Inventory	42,600	
cr. Cost of Goods Sold		42,600
To enter the ending inventory.		

At this point all accounts which determine the cost of goods manufactured—the raw materials accounts, direct labor, the manufacturing overhead accounts, and beginning goods in process—have been closed to Cost of Goods Sold, and appropriate credits have been made to Cost of Goods Sold for the raw materials and goods in process inventories on hand at the end of the period.

Finished Goods

Finished goods consist of those units which have gone through the manufacturing process and have been completed. A separate inventory account usually appears on the books of the manufacturing company in which is recorded the cost of the finished goods on hand as of any balance sheet date. The method of accounting for finished goods is comparable to the method of recording the cost of goods sold for the merchandise trading firm; the cost of goods manufactured of the manufacturing firm is comparable to the purchases of the trading firm. The cost of goods sold consists of the cost of goods manufactured, plus the cost of finished goods on hand at the beginning of the period (which together comprise the cost of goods available for sale during the period), less the cost of finished goods on hand at the end of the period.

All entries necessary for this calculation have already been described except for the handling of the beginning and ending finished goods inventories. Methods of assigning values to the products in finished goods inventory are described in Chapter 10. The entries are as follows:

dr. Cost of Goods Sold	69,200	
cr. Finished Goods Inventory		69,200
To close the beginning inventory.		

dr. Finished Goods Inventory	66,400	
cr. Cost of Goods Sold		66,400
To enter the ending inventory.		

The balance in the Cost of Goods Sold account is then closed to Loss and Gain, as follows:

dr. Loss and Gain	572,500	
cr. Cost of Goods Sold		572,500

VARIATIONS IN PRACTICE

The accounting process described above is by no means used universally. Many modifications arise in accumulating, recording, and reporting cost information in different companies. In particular, the above description does not apply to manufacturers that use a full fledged cost accounting system. As described in Chapter 10, companies using such a system can find cost of goods sold directly without taking a physical inventory and without going through the process of deduction described above. Two other types of variation are described briefly below.

Condensed Closing Process

The form of closing process that has just been described in detail was chosen so as to make it possible to relate the accounting entries to the actual events that occur in a manufacturing company: the acquisition of raw material, the conversion of this material into a manufactured product, the temporary storage of this finished product, and its eventual shipment to customers. The identical end result would be achieved if all the separate entries described were compressed into three entries which (1) closed all beginning inventory balances; (2) set up new inventory balances; and (3) closed purchases, direct labor, and manufacturing overhead accounts. The three entries would be as follows:

(1)

dr. Cost of Goods Sold	242,300	
cr. Raw Materials Inventory		154,300
Goods in Process Inventory		18,800
Finished Goods Inventory		69,200
To close beginning inventories.		

(2)

dr. Raw Materials Inventory	163,120	
Goods in Process Inventory	42,600	
Finished Goods Inventory	66,400	
cr. Cost of Goods Sold		272,120
To enter ending inventories.		

(3)

dr. Cost of Goods Sold	602,320	
cr. Purchases		263,520
Freight-In		9,400
Direct Labor		150,650
Indirect Labor		23,750
Factory Heat, Light, and Power		89,500
Factory Supplies Used		22,100
Insurance and Taxes		8,100
Depreciation—Plant and Equipment		35,300
To close costs.		

The transfer of the Cost of Goods Sold to Loss and Gain would be made exactly as before:

dr. Loss and Gain	572,500	
cr. Cost of Goods Sold		572,500

Expanded Closing Process

Finally, we shall illustrate a closing process in which two additional temporary accounts are used: Raw Materials Used and Cost of Goods Manufactured. The nature of this form of closing is indicated by Illustration 7–3.

SIGNIFICANCE OF THE PROCESS

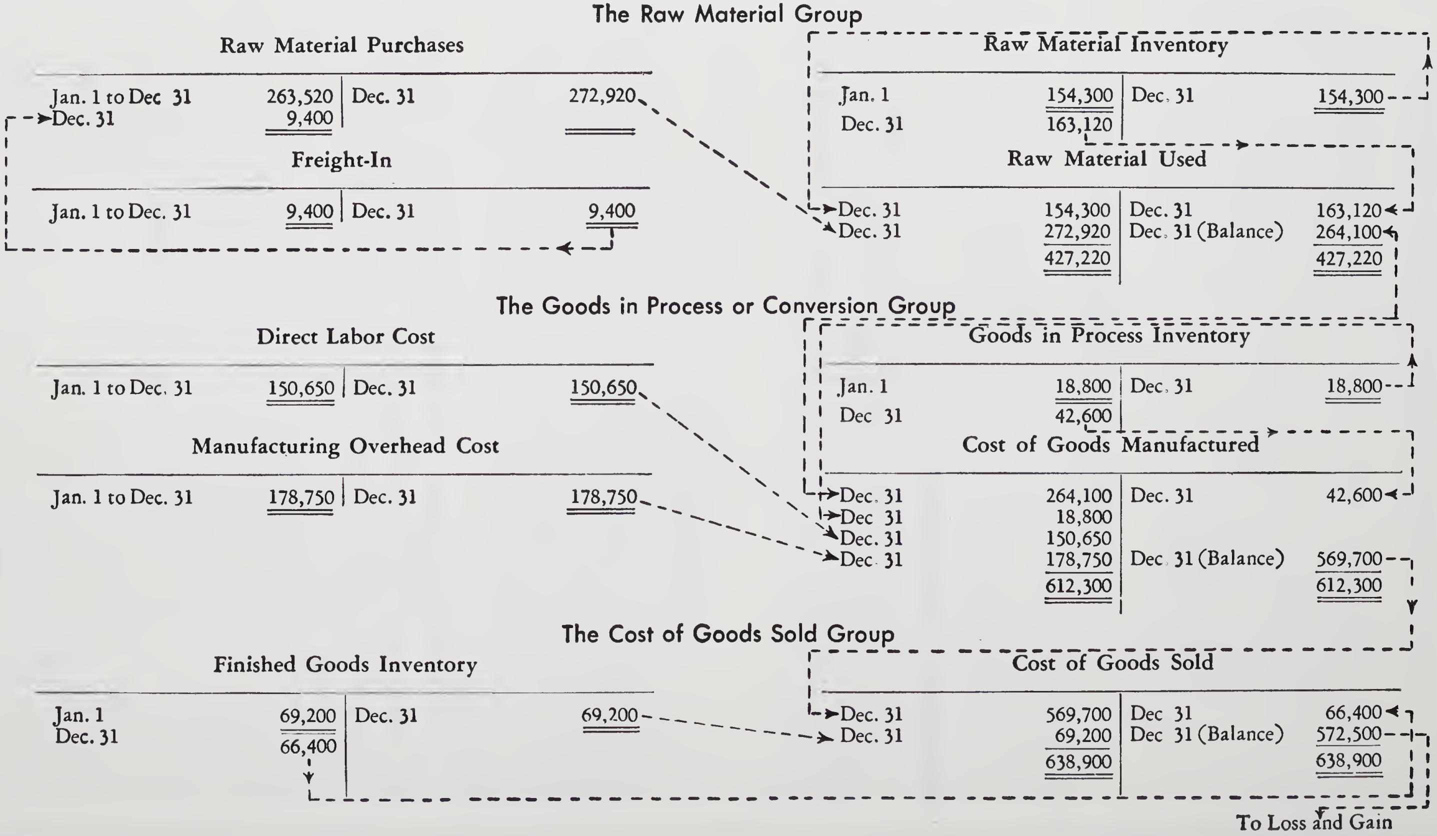
For the objective of this book, there is no particular reason why the student should remember the details of the procedures described in this chapter. He should, however, understand thoroughly the nature of the process, for without such an understanding events that are reflected on the income statement of a manufacturing company can easily be misinterpreted.

A fundamental difference between a manufacturing company and a merchandising company is illustrated by the procedures described. In a merchandising company, costs of labor, supplies, depreciation, and so on affect net income *in the accounting period in which these costs are incurred.* In a manufacturing company, on the other hand, those labor and other costs that are associated with the manufacturing process affect, initially, the value of inventory; they affect net income only in the *accounting period in which the products containing these costs are sold.* This may be a later accounting period than that in which the product was manufactured. The larger the inventory in relation to sales, the longer the time interval that elapses between the incurrence of a cost and its impact on net income.

Consider, for example, a wage increase amounting to $50,000 per year. In a merchandising company, net income would be reduced

Illustration 7–3

FLOW OF FIGURES THROUGH THE ACCOUNTS



The Raw Material Group

Raw Material Purchases

Jan. 1 to Dec 31	263,520	Dec. 31	272,920
Dec. 31	9,400		

Freight-In

Jan. 1 to Dec. 31	9,400	Dec. 31	9,400

Raw Material Inventory

Jan. 1	154,300	Dec. 31	154,300
Dec. 31	163,120		

Raw Material Used

Dec. 31	154,300	Dec. 31	163,120
Dec. 31	272,920	Dec. 31 (Balance)	264,100
	427,220		427,220

The Goods in Process or Conversion Group

Direct Labor Cost

Jan. 1 to Dec. 31	150,650	Dec. 31	150,650

Manufacturing Overhead Cost

Jan. 1 to Dec. 31	178,750	Dec. 31	178,750

Goods in Process Inventory

Jan. 1	18,800	Dec. 31	18,800
Dec 31	42,600		

Cost of Goods Manufactured

Dec. 31	264,100	Dec. 31	42,600
Dec 31	18,800		
Dec. 31	150,650		
Dec 31	178,750	Dec. 31 (Balance)	569,700
	612,300		612,300

The Cost of Goods Sold Group

Finished Goods Inventory

Jan. 1	69,200	Dec. 31	69,200
Dec. 31	66,400		

Cost of Goods Sold

Dec. 31	569,700	Dec 31	66,400
Dec. 31	69,200	Dec 31 (Balance)	572,500
	638,900		638,900

$50,000 in the year in which the increase becomes effective, other things being equal. In a manufacturing company, however, that part of the increase paid to manufacturing employees would first go to increase the inventory value of the products they worked on, and net income would receive the full impact of the increase only when these products were sold. You may find it interesting to explore this phenomenon by tracing through the impact of a $50,000 increase in wages on the two companies whose statements are shown in Illustrations 7–1 and 7–2, assuming (so that the effect of the wage increase can be isolated) that selling prices are not changed.

Similarly, the way in which a manufacturing company classifies its costs as either product costs or period costs can have an important effect on its reported net income since period costs are expenses in the accounting period in which they are incurred, whereas the impact of product costs on net income is felt only when the product is sold.

CASE

CASE 7–1. MARRETT MANUFACTURING COMPANY (A)

The management of the Marrett Manufacturing Company prepared annually a budget of expected financial operations for the ensuing calendar year. The completed budget provided information on all aspects of the coming year's operations. It included an estimated balance sheet as of the end of the year and an estimated income statement.

The final preparation of statements was accomplished only after careful integration of detailed computations submitted by each department. This was done to insure that the operation of all departments were in balance with one another. For example, the finance department needed to base its schedules of loan operations and of collections and disbursements on figures that were dependent upon manufacturing, purchasing, and selling expectations. The level of production activity would be geared to the forecasts of the sales department, and purchasing would be geared to the proposed manufacturing schedule. In short, it was necessary to integrate the estimates of each department and to revise them in terms of the over-all effect on operations to arrive at a well-formulated and profitable plan of operations for the coming year. The budget statements ultimately derived from the adjusted estimated transactions would then serve the company as a reliable guide and measure of the coming year's operations.

At the time the 1956 budget was being prepared in November of 1955, estimated 1955 financial statements were compiled for use as a comparison with the budgeted figures. These 1955 statements were based on nine months' actual and three months' estimated transactions. They appear as Exhibits 1, 2, and 3.

Below is the summary of expected operations for the budget year 1956 as finally accepted:

1. *Sales* (all on credit), $407,000; sales returns and allowances, $3,000; sales discounts taken by customers, $8,000. (The sales figure is net of expected bad debts.)
2. *Purchases of goods and services:*
   - *a*) New assets:
     Purchased for cash: manufacturing plant and equipment, $15,000; prepaid manufacturing taxes and insurance, $6,000.
     Purchased on accounts payable: raw materials, $117,000; supplies, $13,000.
   - *b*) Services used to convert raw materials into goods in process,[2] all purchased for cash: direct manufacturing labor, $70,000; indirect manufacturing labor, $29,000; social security taxes on labor, $3,400; power, heat, and light, $22,200. (Accrued payroll was ignored in these estimates.)
   - *c*) Sales and administrative service, purchased for cash: $67,000.
3. *Conversion of assets into goods in process:* This appears as an increase in the "value" of goods in process and a decrease in the appropriate asset accounts.
   Depreciation of building and equipment, $13,400; expiration of prepaid taxes and insurance, $5,000; supplies used in manufacturing, $15,000; raw materials put into process, $131,000.
4. *Transfer of goods in process into finished goods.* This appears as an increase in finished goods and a decrease in goods in process.
   Total cost accumulated on goods that have been completed and transferred to finished goods inventory, $275,000.
5. *Cost of finished goods sold to customers,* $253,000.
6. *Financial transactions:*
   - *a*) $77,000, borrowed on notes payable to bank.
   - *b*) Bank loans paid off (i.e., retired), $100,000.
   - *c*) Cash payment to bank of $1,200 for interest on loans.
7. *Cash receipts from customers* on accounts receivable, $404,300.
8. *Cash payments of liabilities:*
   - *a*) Payment of accounts payable, $139,800.
   - *b*) Payment of 1955 income tax, $10,500.
9. *Estimated federal income tax* on 1956 income, accrued but unpaid as of December 31, 1956, $29,600.
10. *Dividends* declared for year and paid in cash, $21,000.

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[2] In a manufacturing company, inventory is assumed to increase in value by the amounts spent to convert raw material into salable products. These amounts include the items listed in 2(*b*) plus the items listed in (3) below.

This summary presents the complete cycle of the Marrett Manufacturing Company's budgeted yearly operations from the purchases of goods and services through their various stages of conversion to completion of the finished product to the sale of this product. All costs and cash receipts and disbursements involved in this cycle are presented, including the provision for federal income tax and the payment of dividends.

Questions

1. Journalize each of the estimated transactions. Set up T-accounts with balances as shown on the balance sheet for December 31, 1955, and post the journal entries to these accounts.

2. Prepare an estimated statement of cost of goods sold for 1956, an estimated income statement for 1956, and an estimated balance sheet as of December 31, 1956.

3. Describe the principal differences between the 1956 estimates and the 1955 figures as shown on Exhibits 1, 2, and 3. In what respects is 1956 performance expected to be better than 1955 performance, and in what respects is it expected to be poorer?

Exhibit 1

MARRETT MANUFACTURING COMPANY

Estimated Balance Sheet, December 31, 1955

ASSETS

Current Assets:			
Cash		$ 25,500	
Accounts receivable (net of allowance for doubtful accounts)		60,500	
Inventories:			
Raw materials	$ 55,000		
Goods in process	24,200		
Finished goods	14,300		
Supplies	16,500	110,000	
Prepaid taxes and insurance		5,700	
Total Current Assets			$201,700
Fixed Assets:			
Manufacturing plant	$320,000		
Less: Accumulated depreciation	100,000		220,000
			$421,700

LIABILITIES AND CAPITAL

Current Liabilities:		
Notes payable	$ 33,000	
Accounts payable	20,000	
Unpaid estimated federal income taxes	10,500	
Total Current Liabilities		$ 63,500
Capital		
Capital stock	$330,000	
Retained earnings	28,200	358,200
		$421,700

Exhibit 2

MARRETT MANUFACTURING COMPANY

Estimated Statement of Cost of Goods Sold for Year Ended December 31, 1955

Finished goods inventory, 1/1/55			$ 84,000
Goods in process inventory, 1/1/55		$ 26,000	
Raw materials used		90,000	
Plus: Factory expenses:			
Direct manufacturing labor		49,000	
Factory overhead:			
Indirect manufacturing labor	$19,000		
Power, heat, and light	14,000		
Depreciation of plant	12,800		
Social security taxes	2,500		
Taxes and insurance, factory	5,000		
Supplies	7,900	61,200	
		$226,200	
Less: Goods in process inventory, 12/31/55		24,200	
Cost of goods manufactured (i.e., completed)			202,000
			$286,000
Less: Finished goods inventory, 12/31/55			14,300
Cost of Goods Sold			$271,700

Exhibit 3

MARRETT MANUFACTURING COMPANY

Estimated Income Statement for Year Ended December 31, 1955

Sales		$364,000
Less: Sales returns and allowances	$2,800	
Sales discounts allowed	7,100	9,900
Net sales		$354,100
Less: Cost of goods sold (per schedule)		271,700
Gross profit margin		$ 82,400
Less: Sales and administrative expense		60,000
Net operating profit		$ 22,400
Less: Interest expense		1,200
Net profit before federal income tax		$ 21,200
Less: Estimated Income Tax		10,500
Net Profit after Federal Income Tax		$ 10,700

Chapter

8

CAPITAL STOCK, SURPLUS, AND BONDS

The treasurer and other executives who are responsible for financial affairs in a company need to have a considerable store of technical information about the various means of raising money, the legal and tax rules affecting financial transactions, and so on. Other members of management should have some understanding of these matters, even though they can scarcely be expected to be conversant with all the details. In the accounting area, management needs to know how financial transactions—particularly those relating to capital stock, surplus, and bonds—affect the financial statements; otherwise, certain items reported on the equities side of the balance sheet and certain income statement items will be either incomprehensible or misunderstood. In this chapter, therefore, some of the more common problems encountered in accounting for capital stock and bonds, and in handling surplus, will be discussed.

Although it is difficult to make a precise definition of the words "stocks" and "bonds," for accounting purposes it is usually adequate to think of a bond as representing a liability—a definite promise to pay—and of a share of stock as representing a share in the owners' equity. "Surplus" is a general term for that part of the owners' equity which is not represented by the par or stated value of capital stock. In previous chapters, the term "retained earnings" has been used for this same item. Retained earnings is one type of surplus.

CAPITAL STOCK

Capital stock may be either *common* or *preferred.* Preferred stock has preference, or priority, over common as to the receipt of dividends, as to assets in the event of liquidation, or in other specified matters. There is no substantial difference in the accounting treatment of these two types of stock, however, so no distinction is here made between them. Stock may be either *par value* or *no par value.* Par value stock appears in the accounts at a fixed amount per share (often $10 or $100), which is specified in the corporation's charter or bylaws. Except by coincidence, the par value of the stock in a going concern has no relation to the stock's market value or book value. *Market value* is what people will pay for the stock. *Book value* is the stockholders' equity as reported on the balance sheet; that is, the sum of capital stock plus surplus (or, stated another way, assets minus liabilities).

Recording the Issue

To illustrate the issuance of stock, let us consider the Mason Corporation, which received a charter from the state authorizing the issuance of 10,000 shares of $100 par value common stock. If 100 shares of this stock are subscribed to at par ($100) and immediately paid for, the following entry would be made:

Cash	10,000	
Common Stock		10,000

Sometimes stock subscriptions are paid for in installments. If a down payment of $2,500 is made on a subscription to 100 shares at par with the remainder to be paid one month later, the following series of entries would be made:

1. *Entry when subscription is made:*

Stock Subscriptions Receivable	10,000	
Stock Subscribed		10,000

2. *Entry when initial payment is received:*

Cash	2,500	
Stock Subscriptions Receivable		2,500

3. *Entry when balance of payment is received:*

Cash	7,500	
Stock Subscriptions Receivable		7,500

4. *Entry when stock certificate is issued:*

Stock Subscribed	10,000	
Common Stock		10,000

Par value stock is often sold for more or less than the par value. When sold for more than par, it is said to be sold at a *premium,* and when sold for less, at a *discount.* In such situations, the Common Stock account reflects the full par value of the stock, while the discount or premium, as the case may be, is recorded separately in a Discount on Stock account (which has a debit balance) or in a Premium on Stock account (which has a credit balance). If 100 shares of Mason Corporation common stock were sold at $95 a share, the following entry would be made:

Cash	9,500	
Discount on Stock	500	
Common Stock		10,000

The procedure followed for recording subscriptions to and issuances of no-par value stock is essentially the same as that outlined for par value stock. In many companies, the Capital Stock account for no-par stock is credited with the full subscription price of the shares sold and issued. Some states, however, require or permit corporations to designate a "stated value" for no-par stock. Below this value no shares are sold. When stock is sold above the stated value, the company may credit the Common Stock account with only the stated value of the shares and credit the difference to a "Paid-In Surplus" account. Even if the stock has a stated value, a corporation may disregard it and credit the entire subscription price to the Capital Stock account.

Often, when a stock issue is offered for sale, an investment banking firm (sometimes referred to as the *underwriter*) underwrites the issue, or undertakes its sale. The investment banker receives a fee or "spread" for this service. In recording the issue on its books, the corporation usually considers only the net price received from the investment banker; that is, the price paid by the public for the stock less the banker's spread. If the *net* amount received from the sale is greater than the par value of the stock, premium on stock exists; if the *net* amount received is less than the par value, discount on stock exists. Thus, the calculation of premium or discount is based on the net amount received rather than on the price at which stock is sold to the public.

In connection with the issuance of stock, the corporation itself incurs issue costs over and above the banker's spread. Such costs consist of legal fees, accounting fees, and certain incidentals. As in the case of the banker's spread, issue costs usually are deducted in determining the premium or discount applicable to par value stock.

The following example illustrates the handling of the banker's spread and the issue costs. Suppose the Mason Corporation issues 1,000 shares of $100 par value common stock and sells them to the public at $130. Suppose also that the investment banker's spread is $25 per share and that the issue costs incurred by the Mason Corporation total $4,000. The entries below would be made:

1. *Entry for issue costs:*

Stock Issue Costs	4,000	
Cash (or Accounts Payable)		4,000

2. *Entry when payment is received from investment bankers:*

Cash	105,000	
Common Stock		100,000
Premium on Stock		1,000
Stock Issue Costs		4,000

Balance Sheet Presentation

The presentation of capital stock in the stockholders' equity section of the balance sheet should clearly reveal the *number* of authorized, unissued, and outstanding shares, although the *dollar amount* shown for capital stock pertains only to the shares issued and outstanding. Premium on Stock is shown as an addition to the value of the outstanding shares, and Discount on Stock is similarly shown as a deduction. Paid-In Surplus applicable to no-par stock is shown as an addition to the Capital Stock account to which it applies.

If subscriptions receivable remain on the books on a balance sheet date, they are sometimes shown on the balance sheet. They are listed as a current asset if immediate payment is expected; otherwise they appear in the "other asset" category. If subscriptions receivable are listed as an asset, stock subscribed is shown as an addition to the capital stock outstanding. In some companies, however, subscriptions receivable is omitted from the balance sheet, and only that portion of stock subscribed that has been paid for appears in the stockholders' equity section; when this procedure is followed, capital that has not actually been received does not appear as stockholders' equity.

Illustration 8–1 illustrates the treatment of capital stock accounts in the balance sheet.

Illustration 8–1

MASON CORPORATION

Balance Sheet as of December 31, 1955

Assets		*Liabilities*	$20,000
		Stockholders' Equity:	
		Preferred stock, par value $10, authorized and outstanding 500 shares	$ 5,000
(Details omitted)		Common stock, authorized 10,000 shares; outstanding, 1,300 shares	130,000
		Add: Premium on stock	500
			$135,500
		Retained earnings	10,000
		Total Stockholders' Equity	$145,500
Total	$165,500	Total Equities	$165,500

Treasury Stock

Treasury stock is a corporation's own stock that has been issued and reacquired by purchase or donation but not canceled. When treasury stock is purchased, it is debited to a Treasury Stock account at cost, regardless of its par value. Although a few corporations show treasury stock as an asset on their balance sheet, this practice is difficult to justify since treasury stock is clearly not a "valuable thing or property right owned by the business"; treasury stock is not a claim on anything. The preferable practice is to treat treasury stock as a reduction in stockholders' equity; in other words, treasury stock is treated as a reduction in the number and value of the shares outstanding, which is what it is.

Treasury stock may be acquired by purchase or by donation, and the stock so acquired may subsequently be canceled or reissued. Each of these transactions involves two problems: (1) the time at which adjustments in stockholders' equity should be made, and (2) the determination of the amount involved.

Companies differ as to the timing of adjustments in stockholders' equity to reflect the acquisition of treasury stock. In many companies, treasury stock is carried at its purchase price until the shares are canceled or reissued; at that time adjustments are made in the stockholders' equity to dispose of any differences between the purchase price, paid-in value, and, in the event of reissuance, the realized value. Other companies make the adjustments in stockholders' equity at the time the treasury shares are acquired; that is, the difference between purchase price and paid-in value is disposed of immediately by an adjustment to paid-in surplus. Upon subsequent reissuance of treasury shares, these companies follow the same accounting process as in the case of authorized, but unissued, shares.

If the capital stock was originally issued over a period of time at varying prices, there may be no way of determining the amount originally received from the issuance of the specific shares later reacquired as treasury stock. In this situation the "average paid-in value" becomes the base against which the costs of reacquisition are compared. The average paid-in value is determined by dividing the total number of shares outstanding at the time of the treasury stock transaction into par value less discounts or plus premiums.

The general consensus is that transactions in a company's own stock should not enter into the determination of its net income. The Internal Revenue Code of 1954 specifically provided that no gain or loss can be recognized in treasury stock transactions.

If treasury stock is carried on the books at par value, it may be shown on the balance sheet as a deduction from capital stock outstanding. If treasury stock is carried at its acquisition cost, then the Treasury Stock account is preferably shown as a deduction from total capital stock and paid-in surplus, i.e., total stockholders' equity.

When stock held in the treasury is subsequently sold, the Treasury Stock account is credited with the cost of the stock. Any excess of selling price above cost is credited to a surplus account (such as Profit on Sale of Treasury Stock), which may be shown as a separate item in the capital section of the balance sheet. If treasury stock is sold at a price below cost, the loss may be deducted from Profit on Sale of Treasury Stock if such an account already exists from prior transactions; otherwise the loss is debited to Retained Earnings.

SURPLUS

Surplus consists of two categories: (1) retained earnings (also called "earned surplus") and (2) capital surplus. The term *deficit* means a negative surplus and ordinarily arises from losses from operation (i.e., "minus" retained earnings).

Events and accounting entries that affect *retained earnings* have been described in earlier chapters. In general, retained earnings is increased by net income, is decreased by the declaration of dividends, and is also increased or decreased by certain adjustments in owners' equity that are not shown on the income statement, such as corrections to the reported income of prior years.

Capital surplus can be classified as (1) paid-in surplus, (2) donated surplus, or (3) appraisal surplus, of which paid-in surplus is the most common. *Paid-in surplus* arises when stockholders pay the company more than the par value or stated value of the stock. Transactions resulting in paid-in surplus were illustrated earlier in this chapter in connection with the sale of stock at a premium and the sale of the treasury stock at a price above its cost. *Donated surplus* arises when stockholders give stock back to the corporation, or when they sell it to the corporation at less than par value, or when the acquisition cost of an asset is obviously less than its fair value (as, for example, when valuable minerals are found on land that was purchased at a price much less than the value of those minerals). *Appraisal surplus* arises when the book value of assets is increased as the result of an appraisal; this is done only under most unusual circumstances.

Significance of Surplus

A study of the stockholders' equity section may provide some clues as to the methods used to obtain capital, as to transactions involving the purchase or sale of treasury stock, or as to the existence of unusual events not reflected in the income statement that result in changes in the stockholders' equity. An analysis of the growth in retained earnings in relation to net income may indicate the extent to which the company has obtained capital by "plowing back" its earnings.

Under certain circumstances, the amounts reported as surplus may affect the payment of dividends. In some states, dividend payments cannot exceed the amount shown on the books as retained earnings, while other state laws allow dividend payments to equal retained earnings plus certain types of capital surplus. In still other states, however, dividend payments can be made if there are earnings in the current year, even though a deficit is shown in the surplus section of the balance sheet. Moreover, even in those states that restrict dividends to the amount reported as retained earnings or surplus, the legal restriction often has no bearing on dividend policy. In most companies, dividend policy depends on such considerations as the amount of cash available, the alternative uses of these funds, the effect of dividends on stock prices and on the sale of new securities, and fairness to stockholders, rather than on a legal restriction.

Some accountants advocate that stockholders' equity be reported as a single figure rather than showing separate amounts for stock and various kinds of surplus. Although this is not in accordance with generally accepted accounting principles, the suggestion does emphasize the difficulty of attempting to obtain useful information from the separate figures that appear in the stockholders' equity section of the balance sheet.

Stock Dividends

Some stockholders, in the mistaken belief that the amount reported as surplus is "their money," put pressure on the directors to authorize cash dividends equal to, or almost equal to, the amount of surplus. However, these same stockholders may be quite satisfied with a *stock dividend,* which actually does not change their equity in the corporation since it results in nothing more than a decrease in surplus and an exactly equal increase in the value of stock outstanding. For example, a corporation with outstanding capital stock of $1,000,000 (10,000 shares, $100 par value) and surplus of $4,000,000 might authorize a 100 per cent stock dividend; that is, each stockholder would be given an additional $100 share for each share he owned. This would increase capital stock to $2,000,000 and would reduce surplus to $3,000,000, but the *total* stockholders' equity would remain $5,000,000; assets would remain unchanged; and the equity of any individual stockholder would not be affected. Presumably, the *market* value of each share of stock would be cut in half (or almost in half), and this might be beneficial to the stockholders since stock with a low market price per share tends to be more attractive than high-priced stock.

Incidentally, a stock dividend is not quite the same as a stock split. In a *stock split,* the only effect on the balance sheet is that the number of shares of stock outstanding is increased; there is no change in the total stated value of the stock and no change in surplus.

Surplus Reserves

In an attempt to explain to stockholders why they do not receive dividends that are equal to the amount shown as surplus, a corporation may show on its balance sheet an appropriation or reserve as a separate item that is subtracted from surplus. Some of the terms used to describe the reasons for such an appropriation are: *reserve for bond sinking fund,* which indicates a restriction on dividends in accordance with agreements made to bondholders; *reserve for contingencies,* indicating management's belief that funds may be required for an unusual purpose or to meet a possible obligation that does not yet have the status of a liability (such as settlement of a pending lawsuit, or a retroactive wage increase); *reserve for inventory price decline,* indicating the possibility that inventory may be sold at a price less than the value reported on the balance sheet; and *reserve for expansion,* indicating an intention to use funds for the acquisition of new assets.

None of these reserves represent money, or anything tangible; the assets of a business are reported on the assets side of the balance sheet, not in the stockholders' equity section. The accounting entry creating the reserve involves a debit to Retained Earnings (or some other surplus account) and a credit to the reserve. This entry obviously does not affect any asset account, nor does the reserve represent anything more than a segregated portion of surplus.

Other Types of Reserves

In addition to its use in the situations described above, the word "reserve" is also used in two other quite different connections in accounting: as asset valuation accounts and as liability accounts. Because of the confusion that naturally arises when the same word is used with three different meanings, its use in these other two senses is becoming obsolete. Reserve for bad debts and reserve for depreciation are examples of *valuation reserves;* terms such as "allowance for bad debts" or "accumulated depreciation" are now preferred. A *liability reserve* refers to an obligation whose existence is definite but whose amount is uncertain at the time the balance sheet is prepared. Reserve for income taxes is an example. This title is being superseded in practice by terms such as "estimated income tax liability" or "provision for income taxes."

BONDS

Recording the Issue

To illustrate the entries typically made to record a bond issue, let us assume the Mason Corporation sells 100 $1,000 par value, 4 per cent, twenty-year, first mortgage bonds. If the corporation receives par value for the sale of these bonds, the following entry would be made:

Cash	100,000	
Bonds Payable		100,000

Frequently bonds are sold for less than their par value, i.e., at a *discount,* or for more than their par value, i.e., at a *premium.* If the Mason Corporation received only $950 for each $1,000 bond, the following entry would be made:

Cash	95,000	
Bond Discount	5,000	
Bonds Payable		100,000

If the bonds are sold at a premium, this entry would be made:

Cash	105,000	
Bond Premium		5,000
Bonds Payable		100,000

As in the case of stock, the sale of a bond issue is usually undertaken by an investment banking firm which charges a fee for this service. Determination of bond premium or discount is based on the net amount the corporation receives from the investment bankers and not on the price at which the bonds are sold to the public.

If bonds are sold after the bond contract date (i.e., the date on which interest starts to be earned), the purchaser pays both the price of the bond itself and the interest that has accrued up to the date of the transaction. This is done because the corporation, for reasons of convenience, will pay to all bondholders the interest earned for the full period (usually six months) beginning with the contract date, and the purchaser is clearly not entitled to interest for the period prior to the time he purchased the bonds. If, for example, these 4 per cent Mason Corporation bonds were sold three months after the contract date, at a price that netted their par value to the corporation, the following entry would be made:

Cash	101,000	
Bonds Payable		100,000
Bond Interest Expense		1,000

After the semiannual interest payment has been recorded, as shown below, Bond Interest Expense will reflect the net interest expense of the period.

Balance Sheet Presentation

Bonds payable are shown in the fixed liabilities section of the balance sheet until one year before they mature, when they become current liabilities. If the bonds are to be retired in installments, that portion which will be retired within a year is shown in the current liabilities section.

Bond discount is often shown as a deferred charge on the asset side of the balance sheet (but not as a current asset), and bond premium is often shown as a deferred credit on the liability side. In some corporations, bond discount (or premium) is shown as a deduction from (or addition to) bonds payable on the liability side.

Corporations generally incur various costs in connection with the marketing of a bond issue. These "issue costs" may be shown in the "other assets" section of the balance sheet, or they may be recorded as an increase in bond discount (or as a reduction in bond premium), similar to the treatment described above for the issue costs of stock.

Bond Interest, Premium, and Discount; Issue Costs

An accounting entry is made to record the periodic interest payments to bondholders (usually every six months) and at the same time to amortize a portion of the bond premium or discount. The effect of this entry is that the *net* debit to Interest Expense reflects not the *actual* interest paid to bondholders (unless the bonds are sold at par); rather, it reflects the effective rate of interest, which is larger or smaller than the stated rate according to whether the bonds were sold at a discount or at a premium. The existence of bond discount in effect increases the interest expense, while the existence of bond premium decreases it.

Bond discount or premium may be amortized in one or two ways:

by the straight-line method, in which the discount is debited (or the premium is credited) to Interest Expense in equal installments over the life of the issue; or by the compound interest method by which the discount or premium is debited or credited to Interest Expense in increasing amounts each succeeding period. When the compound interest method is used, the discount or premium is written off in such a way that the net interest expense bears a constant ratio to the book value of the bonds over the whole life of the issue.

The following entry records the semiannual bond interest payment and amortization of discount on a straight-line basis for the Mason Corporation bonds that were assumed to have been sold at 95:

Interest Expense	2,125	
Bond Discount		125
Cash		2,000

If the interest date does not coincide with the closing of the company's books, an adjusting entry must be made to record accrued interest expense and amortization of discount or premium. Assuming that the Mason Corporation bonds are sold at 95 on September 30, that the interest dates are September 30 and March 31, and that the fiscal year ends on December 31, the following entries would be made:

1. *Adjustment on December 31:*

Bond Interest Expense	1,062.50	
Bond Discount		62.50
Accrued Interest Payable		1,000.00

2. *Payment of semiannual interest on March 31:*

Bond Interest Expense	1,062.50	
Accrued Interest Payable	1,000.00	
Bond Discount		62.50
Cash		2,000.00

3. *Payment of semiannual interest on the following September 30:*

Bond Interest Expense	2,125.00	
Bond Discount		125.00
Cash		2,000.00

Bond issue costs are likewise amortized by debits to Interest Expense over the life of the issue. Sometimes bond issue costs are added to Bond Discount or deducted from Bond Premium for convenience, the net amount then being amortized over the life of the issue.

Retirement of Bonds

Bonds may be retired in total, or they may be retired in installments over a period of years. In either case the retirement is recorded by a debit to Bonds Payable and a credit to Cash. The bond discount or premium will have been completely amortized by the maturity date, so no additional entry is required for discount or premium at that time.

Bonds are sometimes retired at maturity out of a sinking fund which has been created in installments over the life of the issue. Bond sinking funds may be controlled by the originating corporation, or they may be controlled by a trustee under specified contractual arrangements. In either case, such funds usually appear in the investment section of the assets side of the balance sheet.

Sometimes the terms of a bond issue require not only the creation of a sinking fund but also the establishment of a sinking fund reserve by transfers from Retained Earnings. As explained above, a sinking fund reserve calls attention to a restriction on the payment of dividends. Once the bonds are retired, this restriction is lifted, and the reserve is transferred back to Retained Earnings.

The company may decide to retire bonds earlier than the date originally specified. If such bonds were sold at a discount (or premium), an unamortized discount (or premium) will exist as of the date of early retirement because the schedule of amortization was originally set up so as to charge off the discount (or premium) over the specified life of the issue. The unamortized balance is accordingly charged against retained earnings. It may, or may not, be shown as an expense of the current accounting period, depending on whether or not the "clean surplus" doctrine is followed. An illustrative entry, showing the retirement of Mason Corporation bonds at the end of ten years (i.e., half their scheduled life) would be:

Bonds Payable	100,000	
Retained Earnings	2,500	
Cash		100,000
Bond Discount		2,500

Refunding a Bond Issue

The terms of some bond issues state that the bonds can be called, or retired before maturity, by paying for them at a premium, that is, by paying more than the par value. In this case, a schedule of *call prices,* which decrease each succeeding year as maturity is approached, is included in the terms of the issue. In times when interest rates have declined, a company may consider it advantageous to *refund* the old bond issue, that is, to call the old issue, and float a new one with a lower rate of interest. Problems then arise in accounting for the call premium (the difference between the call price and par value) and any unamortized issue costs and discount (or premium) on the old bonds.

The American Institute of Accountants in its *Accounting Research*

Bulletin No. 43 discusses the various alternatives for handling the above items:

> Discussion of the treatment of unamortized discount, issue costs, and redemption premium on bonds refunded (hereinafter referred to as unamortized discount) has revolved mainly about three methods of disposing of the unamortized balance:
>
> (a) A direct write-off to income or earned surplus.
> (b) Amortization over the remainder of the original life of the issue retired, or
> (c) Amortization over the life of the new issue.
>
> Each of these methods has had support in court decisions, in determinations by regulatory agencies, and in accounting literature. The reasoning and conclusions reached by the committee in regard to them are given here.
>
> It is acceptable accounting to write off unamortized discount in full in the year of refunding. This treatment is based on the view that the unamortized bond discount represents in effect the cost of the privilege of terminating a borrowing contract, which has become disadvantageous and hence comes under the accounting doctrine that a loss or expense should be recognized as such not later than the time when the series of transactions giving rise to it is completed.
>
> . . . Where a write-off is made to earned surplus, it should be limited to the excess of the unamortized discount over the reduction of current taxes to which the refunding gives rise.
>
> The second alternative, distributing the charge over the remainder of the original life of the bonds refunded, has strong support in accounting theory. Its chief merit lies in the fact that it results in reflection of the refinancing expense as a direct charge under the appropriate head in a series of income accounts related to the term of the original borrowing contract.
>
> This method is based on the accounting doctrine that when a cost is incurred the benefits of which may reasonably be expected to be realized over a period in the future, it should be charged against income over such period. In behalf of this method, it is argued that the unamortized bond discount represents the costs of making a more advantageous arrangement for the unexpired term of the old agreement. . . .
>
> This [second] method should be regarded as preferable. It conforms more closely than any other method to current accounting opinion.
>
> Where this method is adopted, a portion of the unamortized discount equal to the reduction in current income tax resulting from the refunding should be deducted in the income statement, and the remainder should be apportioned over the future period.
>
> The third alternative, amortization over the life of the new issue, runs counter to generally accepted accounting principles. It cannot be justified on the ground that cost may be spread over the period during which the benefit therefrom may be presumed to accrue. Clearly discernible benefits from a refunding accrue only for the period during which the new issue is replacing the previously outstanding issue. . . .[1]

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[1] American Institute of Accountants, *Accounting Research Bulletin No. 43,* pp. 129–31.

Generally, if the alternative of amortizing over the remaining years of the old bond issue is chosen, the balances of all accounts which refer to the refunded issue, such as call premium, unamortized premium or discount, and issue costs, are closed into a single account, which might be called, for example, "Unamortized Charges on 4 per cent Series A Mortgage Bonds." This single account is carried on the books and amortized over the remaining years of the old bond issue.

Chapter

9

REVIEW OF ACCOUNTING CONCEPTS

The preceding chapter completes our brief description of basic accounting concepts and conventions. The student may therefore find it appropriate to think back over the material discussed up to this point, both in the text and in the cases, in an attempt to make generalizations about the subject as a whole.

As pointed out in Chapter 1, accounting has two general objectives: (1) to provide information about the status and progress of the business for the use of outsiders, such as stockholders, lenders, and other interested parties; and (2) to provide information for management. Historically, accounting concepts and techniques were developed primarily to meet the first objective; hence the material in the first part of this book focuses on accounting for external reporting purposes. The central topic in the remainder of the book is the use of accounting information for management purposes.

SOME THINGS YOU DO KNOW

Although this introduction to accounting has been brief, you should now be able, on the basis of the material described up to this point, to analyze *any* event in terms of its effect on the assets and equities of the business. More experienced accountants may be able to make an analysis more quickly than you can, but there is no clearly described transaction for which you cannot formulate a reasonable journal entry, provided you are given enough time to think it through.

Moreover, you know how to summarize all the transactions for a period into financial statements—the balance sheet and income statement—which describe, respectively, the financial condition of a business as of a moment of time and the events that have resulted in net income (or loss) for a period of time. Accounting makes it possible to summarize the numerous and heterogeneous events of even the most complicated business into two brief documents, and this is a remarkable achievement, whose significance should be appreciated every time you observe a business in operation, whether it be a small retail store or General Motors Corporation.

On the other hand, the financial statements for a going business cannot provide a complete or entirely accurate description of the business. You may find it useful, at this point, to attempt to summarize your understanding of these financial statements on the basis of the work done thus far. Since the impressions that a student derives from the study of any subject inevitably differ from those of other students and also from those of his instructor, no attempt is made here to specify what this summary should include. As a stimulus to thinking, however, some questions worth considering and some tentative statements against which you can test your own impressions are given below.

The Balance Sheet

What, really, is a balance sheet? The American Institute of Accountants definition of a balance sheet as a "list of balances in the asset, liability, and net worth accounts" is like the statement that "a rose is a rose"; it is accurate, but it doesn't say anything meaningful. The principal difficulty in attempting to formulate a more useful definition comes in reconciling the differing values at which the various items are stated. The rule that "value equals cost" is a reasonably adequate way of describing the basis on which assets are originally recorded at the time they are acquired, but this same rule does not explain the residual values that appear on the balance sheet, especially in the case of net fixed assets, inventory (which may be stated below cost), or accounts receivable (when adjusted for expected bad debt experience).

Here is an over-all generalization to think about: the balance sheet shows the sources from which funds currently used to operate the business have been obtained (liabilities and owners' equity) and the kinds of things in which these funds are locked up (assets). This view regards the balance sheet as essentially a report of management's *stewardship;* i.e., what management has done with the funds entrusted to it. This concept of the flow of funds through a business is more fully described in Chapter 11.

As you can see, a meaningful, over-all definition is difficult to formulate. It is much easier, and more useful, to attempt separate descriptions of the various sections of the balance sheet. It may be helpful to consider to what extent you agree with the following statements:

Current assets and current liabilities (which together constitute *working capital* or *circulating capital*) show the funds that are circulating through the business reasonably rapidly. They reflect the recurring, circular flow: inventory ⟶ accounts receivable ⟶ cash ⟶ payables ⟶ inventory. The essential characteristic that distinguishes the current items from other balance sheet items is their flexibility; that is, management has more frequent opportunities to make decisions on the recommitment of funds in the case of current items than in the case of noncurrent items.

Current assets can usefully be divided into two groups. One group consists of cash, temporary investments held in lieu of cash, and accounts receivable. This group is valued essentially at the market or realizable value of the items included. (For receivables, this statement implies that the company can make a reasonable estimate of its bad debt losses.) The other group consists of inventories and prepaid assets. Items in this group are held for the benefit of operations in future periods, and their value to the business is that their existence reduces the necessity for making outlays for similar goods and services in future periods. Except for the difference in their life, items in this group are essentially similar to fixed assets. The reported value of inventory may approximate market value in situations where prices are not subject to rapid fluctuation and where inventories are small relative to sales, but in most situations, inventory is best viewed as a reservoir of asset values. Items are pumped out of inventory in response to operations; they are replaced with new items purchased (or manufactured), and changes in the level of inventory reflect management policy.

The *fixed asset* section of the balance sheet is a statement of unexpired costs; that is, it shows costs that have not yet been charged against operations. Ordinarily, the amounts listed bear no relation to market value, and no inference as to such value should be attempted solely on the basis of balance sheet information.

The *liabilities* section is a valid list of obligations for which the company is legally liable as of the balance sheet date. It does *not* necessarily show the amounts for which the company *will become* liable in the ensuing period, however. For example, if an automobile is purchased on December 31 for $2,000 and if the business signs a note agreeing to pay the $2,000 at the rate of $50 per month for forty months, the note appears as a current liability (notes payable) on the December 31 balance sheet. On the other hand, if, instead, the business *rents* an automobile on December 31 and signs an agreement to pay $50 a month rent for forty months, no record of this obligation appears as a liability (although it may be indicated in a footnote to the balance sheet). This difference in treatment is quite proper; an attempt to record the rent obligation would make the balance sheet even more complicated than it is.

The *owners' equity* section gives some useful bits and pieces of information, such as the number of outstanding shares of stock of various types, clues as to dividend policy, and so on; but as an indication of the real "worth" of the stockholders' equity, it has no meaning whatsoever except in those rare instances where a company's assets consist entirely of cash or readily marketable securities. Although this point should by now be fairly obvious, its importance is such that an additional illustration is given below.

Example: Nudoll Company

A company, here called the Nudoll Company, spent three years and some $90,000 developing a new product. By the end of 1954 the product was ready for market and seemed to have a promising future. Of the funds used up to that point, $30,000 had been contributed by the management, in exchange for common stock, and $60,000 had been loaned by a friend, payable on demand. The balance sheet at that time, in round numbers, was as shown in Illustration 9–1.

Illustration 9–1

NUDOLL COMPANY

Balance Sheet as of October 31, 1954
(As Originally Prepared)

ASSETS		EQUITIES		
Cash	$1,000	Accounts payable		$ 2,000
Inventory	6,000	Notes payable		60,000
Total Current Assets	$7,000	Total Current Liabilities		$62,000
		Capital stock	$30,000	
		Less: Deficit	−85,000	−55,000
Total Assets	$7,000	Total Equities		$ 7,000

The Nudoll Company obviously needed additional capital, which the management planned to raise by selling stock. An advisor pointed out that the balance sheet shown in Illustration 9–1 would look unattractive to prospective investors. Two steps were therefore taken: (1) the person who had loaned the $60,000 agreed to sign a five-year note, with the informal understanding that he would be repaid as soon as funds were available (this understanding was the same as his understanding when he made the loan, even though technically the original note was payable on demand); and (2) the expenditures to develop the new product were set up as an asset on the grounds that these costs were incurred in order to benefit future periods. These changes produced the balance sheet shown in Illustration 9–2. According to this revised balance sheet, current assets were 3.5 times current liabilities, total assets were 14 times as large as those shown on the first balance sheet, and the company had a surplus (which resulted from the profitable sale of trial lots of the new product).

Illustration 9–2

NUDOLL COMPANY

Balance Sheet as of October 31, 1954
(As Adjusted)

ASSETS		EQUITIES		
Cash	$ 1,000	Accounts payable		$ 2,000
Inventory	6,000			
Total Current Assets	$ 7,000	Total Current Liabilities		$ 2,000
Unamortized development costs	90,000	Long-term debt		60,000
		Capital stock	$30,000	
		Surplus	5,000	35,000
Total Assets	$97,000	Total Equities		$97,000

Both these balance sheets were prepared in accordance with generally accepted accounting principles. Each shows certain useful information: that the company has some cash and a little inventory, that it is probably going to have difficulty meeting its bills unless it obtains more cash quickly, and that it owes someone $60,000. Neither one describes the over-all status of this company, for its status depends almost entirely on the excellence of the new product, and this will not be known until the product is marketed.

The Income Statement

What is the meaning of "net profit," the final item on an income statement? Defining net profit as management's estimate of the excess of revenue over expenses is not very satisfactory, since it begs the question of what are revenue and expenses; but is there a better definition?

How reliable is the estimate of the net profit for an accounting period? Reliability depends primarily on: (1) the length of the accounting period chosen, (2) the extent to which events relating to the current period are separated from events affecting prior or future periods, (3) the amount of long-lived assets owned by the company, and (4) the stability of prices. Estimates of net profit for a day or a month are likely to be much less reliable than estimates for a year, and estimates for a year less reliable than estimates covering a longer period.

Although the expenses and revenue assigned to a period are supposed to relate to that period, it usually is not practicable to attempt a precise relationship. For example, advertising is typically "bread cast upon the waters" in the hope of stimulating sales in future periods, yet advertising is invariably charged as an expense in the period in which the advertising is done. The difficulty of estimating the portion of the cost of a long-lived asset applicable to a given accounting period has already been described. Finally, fluctuations in prices influence the income statement in many ways, some of which will be explored in Chapter 13.

For all these reasons, the net profit reported on the income statement is unlikely to correspond exactly to the real increase in owners' equity during an accounting period. The true *monetary* profit of an enterprise can be known only after the enterprise has been completely terminated and its assets disposed of. The nonmonetary "profits"—personal satisfaction, service, and so on—are not determined from accounting reports even then. Any attempt to measure profit for a shorter interval of time is necessarily somewhat arbitrary.

Nevertheless, certain of the individual items on an income statement may be highly reliable. The sales revenue figure is usually a close approximation to real sales revenue, and the figures for many expense items, such as wages, supplies, light, and power are close approximations to real expenses. Depreciation, on the other hand, is usually only a rough approximation, while some of special adjustments reported as nonoperating expenses may be little more than informed guesses.

Limitations on Accounting Data

Since a business is a complex organism, it would be completely unrealistic to expect that accounting, or any device, could record the full scope of its activities. Listed below are three ways in which an accounting report falls short of conveying an accurate and complete story. You may want to attempt to generalize on the importance of each of these limitations in various types of practical problems.

1. Accounting reports are limited to information that can be expressed in monetary terms. Nothing in the accounts explicitly describes personalities, the impact of outside forces, or other nondollar information that is vital to the complete understanding of a business.

2. In accounting, no attempt is ordinarily made to recognize the market value of assets except at the time of their acquisition and disposition. Assets as shown on the balance sheet represent, generally, the original cost of acquisition or some residual fraction thereof, not the

present value of these assets. (Accounting could conceivably be geared to some other concept of value. Do you think the advantages of the "value equals cost" idea outweigh the disadvantages?)

3. Some accounting figures are influenced by future events which cannot conceivably be foreseen; these figures are necessarily estimates. The depreciation expense of the current period, for example, depends partly on how long the assets will be used in the future. The real significance of accounts receivable and the related item of sales revenue cannot be assessed until the number of credit customers who will not pay their bills is known. Inventory values really depend on what the merchandise can be sold for in the future, and so on. Incidentally, note that accounting reports usually violate the rule of significant numbers mentioned in Chapter 2 in that they contain numbers carried out to the last cent (e.g., depreciation, $1,478,992.57) or the last dollar, whereas these numbers are based on estimates that are actually significant to only two or three digits.

SOME THINGS YOU DO NOT KNOW

It may also be useful to list some things that the practicing accountant knows about accounting, over and above the material which has been described in this introduction to accounting:

1. The accountant knows procedures for recording accounting transactions quickly, efficiently, and accurately. There are a great many techniques and mechanical aids for facilitating the bookkeeping process, only a few of which have been described here.

2. The accountant knows about techniques for preventing or detecting falsification of the records, or embezzlement. This is part of the subject called "internal auditing."

3. The accountant knows about techniques for arranging and presenting information in ways designed to fit the needs of various types of readers.

4. The accountant knows much about tax laws and regulations. Although income tax requirements should not govern the manner in which information is collected and presented to management, tax considerations do play a major part in many business decisions. Many businesses have a tax specialist in their accounting or legal departments, and most others must, fairly frequently, request advice on tax matters from their lawyers or public accountants.

5. The accountant knows legal requirements that govern, or influ-

ence, certain types of transactions. These requirements principally relate to the owners' equity section of the balance sheet. Some, but by no means all of them, have been mentioned in Chapter 8.

6. The accountant knows, or can find by referring to accounting texts or handbooks, generally accepted ways of handling many specialized types of transactions that have not been mentioned in this introductory treatment.

7. The accountant knows terminology and procedures for handling transactions that are used by many companies in the same industry as his company. As a result of tradition or of problems peculiar to the industry, each industry tends to develop a more or less common pattern for handling certain types of transactions.

8. The accountant knows a great deal about his own company, the sort of information that management and others have found useful, and the way recurring transactions have been handled in the past—in short, all the matters that come under the heading of "experience," and for which no book or classroom is a satisfactory substitute.

DIVERSITY IN DETAIL

One final summary comment is in order. Although most companies follow generally accepted accounting principles, there is much permissible latitude in the application of these principles. Consequently, although there is a general similarity that characterizes most financial statements and the accounts from which they were prepared, there is considerable diversity of practice among companies as to details, and even some diversity on important matters.

No one can state reliably what the "general practice" is or how the majority of companies handle any specific problem. There are at least 3,000,000 accounting entities in the United States, of which about 300,000 are corporations. No report on the accounting practices of these companies exists. The largest survey is probably that published by the U.S. Office of Price Administration in 1946,[1] which summarizes, in a general way, a few of the practices of 187,370 companies. *Accounting Trends and Techniques,* an annual publication of the American Institute of Accountants, reports the practices of approximately 600 of the largest corporations. A person who has a personal knowledge of the detailed procedures of as many as 100 companies has an unusually broad experience. Thus, generalizations about what "the majority of companies" do with respect to detailed accounting matters should not be taken too seriously.

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[1] Accounting Department, U.S. Office of Price Administration, *A Report on Cost Accounting in Industry,* June 30, 1946.

It follows that a detailed comparison of the items reported in the financial statements of two companies is a difficult problem. Useful comparisons can often be made, in terms of rough approximations, but precise statements are rarely possible.

The existence of diversity in accounting practice should not be considered as a reason for criticizing accountants or accounting. The fundamental fact is that, as stated above, a business is a complex organism. There is no conceivable way of prescribing a uniform set of rules by means of which the significant facts about that organism can be reduced to a few pages of figures, any more than there is any way of formulating a standard set of rules for biographers. Standard procedures for listing physical characteristics, birth dates, marital status, and certain other information about a person can easily be specified, but these details do not really describe the person completely. The accuracy and usefulness of the "picture" of a person that emerges from a biography depends on the author's skill and judgment in the collection, analysis, and presentation of information about his subject.

A business is much more complex than a person, and the job of presenting its accounting biography must also depend to a large extent on the accountant's skill and judgment in collecting, analyzing, and presenting the accounting facts about the business.

CASES

CASE 9–1. BROOK CALENDAR COMPANY

In July, 1953, Miss Joan Brook, owner of the Brook Calendar Company, was anxious to learn the financial condition of her company. Miss Brook had gone into the calendar publishing business after several years of employment as a librarian. All of her business was conducted in her apartment where she and her mother lived. She had the printing and binding done on contract, and the company that did her binding also stored her inventory of calendars and shipped them to customers. The only functions that Miss Brook actually performed herself were those of calendar design, selling, and record keeping.

Most of the records of the business were kept in boxes and in a wicker basket on the floor of the apartment. Accounts receivable records were kept in the apartment of an employee of the business who worked on them there. Most expenditures were made by check, and Miss Brook kept a record of them in a checkbook. However, she bought supplies and paid bills incurred for the business out of her own personal funds from time to time. These expenditures were noted on small slips of paper which she kept in her desk drawer.

The calendar publishing business was highly seasonal. The first half of the year was a period of large disbursements while the second half was a period of cash inflow. This unevenness was somewhat disturbing to Miss Brook because her records provided no information as to what her expenses had been or as to what she had added to the business in the form of profits.

In describing the position of the Brook Calendar Company as of January 1, 1953, Miss Brook said that its bank balance was $3,335,[2] as shown by the monthly statement furnished by the bank; however, there were outstanding checks amounting to $2,607, so the company's cash only amounted to $728. Also, on January 1 she had on hand calendars dated 1953 which had cost $2,280. She had hoped to sell them to interested parties and had a firm offer from a remainder house for $230 for this inventory. She had no office supplies on hand at that time because she had moved to a new apartment on January 1 and had not wanted to have any inventory of supplies to move.

The new apartment rental was $90 per month payable in advance. Miss Brook planned to charge two thirds of this rent to the business and one third as her personal living expense. On the last day of each month she paid the rent for the following month with company funds. The January rent had been paid on December 31.

When she moved, she had office equipment and office furniture that had cost $493. Although it had been purchased early in January, 1952, she had never charged any depreciation on it. She thought that 10 per cent per annum was a reasonable depreciation rate for these assets.

She also remembered that on January 1 the company had accounts receivable outstanding of $5,681. She had no idea of the age of these accounts because the invoices for them were filed alphabetically, but she felt certain that she could collect them all. The company owed bills for printing and binding totaling $770 on January 1.

The first three months of 1953 were marked by little activity. Miss Brook developed her 1954 line of calendars and she purchased photographs costing $933 for use in this line. She also sold her stock of 1953 calendars for $230.

In January she paid the $770 printing and binding bills, and the balance in the company bank account became so low that she transferred $7,000 from her personal savings account to her business account.

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[2] For ease of computation all figures have been rounded to the nearest dollar.

From the end of March until June 30 a great number of transactions took place. She incurred advertising expense of $523, of which all but $5 had been paid by June 30. In spite of this advertising, sales of 1954 calendars to June 30 fell short of expectations and amounted to only $10,499, $274 of which had been paid for by the purchasers. In addition, the company paid, and customers owed, $355 postage and shipping expense on these sales.

In her personal selling attempts Miss Brook had found it necessary to do a great deal of traveling and entertaining. She had accumulated cash slips for these expenses totaling $540, which she had paid out of her pocket. Accordingly, she withdrew $540 from the business account and put it in her personal account.

Purchase of office supplies up to June 30 amounted to $474, of which $45 had not yet been paid. Miss Brook estimated that she still had $200 of these supplies on hand as of June 30.

Salaries had been a heavy expense since the end of the first quarter. Since January 1 she had paid $2,928 cash in salaries to salesmen and other employees. From the $3,139 gross earnings of these employees $167 had been deducted for withholding taxes, of which $112 had already been paid to the government, and $44 for the employees' contribution to social security, of which $17 had already been paid to the government. The company's social security tax expense on these salaries totaled $44, of which Miss Brook still owed the government $27. Salaries for the first six months still unpaid as of June 30 totaled $250, most of which was earned by Miss Brook's mother who aided her in various aspects of the business. From this $250 salary expense, withholding taxes of $26 and social security taxes of $4 were to be deducted, and employees were to be paid the difference. The company's liability for social security taxes on these salaries was $4.

A total of $1,460 was still owed by customers on 1952 bills when Miss Brook totaled these invoices on June 30. Although the bills that had not been paid were getting quite old, Miss Brook still felt that none of them would be bad debts, even though they were owed by small businesses that had the same sort of seasonal peak as her business. She believed that during the fall, when business picked up for them, her customers would pay.

There had been a number of expenses incurred in connection with maintaining the apartment. These had been paid from Miss Brook's personal account. She estimated that expenses applicable to the Brook Calendar Company, mostly for telephone and maintenance, amounted to $386.

Most of the printing and binding for the year had been done by June 30. Paper had been purchased in the amount of $5,732, of which $1,947 had been paid. Of this amount $1,512 was still on hand; the remainder had been used for printing calendars. She owed $7,954 to her printer and $4,360 to the bindery.

The printing, binding, and paper expense had been for a total of 49,000 calendars, of which 20,100 had been sold. There were several styles of calendars, but because the only differences between one style and another were the picture and the text, the printer and binder charged the same price per calendar, regardless of the style.

Questions

1. Prepare a balance sheet for the Brook Calendar Company as of January 1, 1953.
2. Explain how the events described in the case would be reflected on the balance sheet and income statement.
3. Prepare a balance sheet as of June 30, 1953, and an income statement for the six months ended on that date.

CASE 9–2. HARRY ERNEST

On March 15, 1952, Mr. Harry Ernest signed a lease agreement to operate a gasoline service station which was owned by the Octane Oil Company. Mr. Ernest had contacted the regional sales manager of the Octane Oil Company in response to an advertisement which solicited applicants "with $2,500 to invest" to lease and operate a newly erected Octane Oil Company gasoline service station in a large eastern city. Mr. Ernest had been able to accumulate approximately $3,000 for investment purposes as a result of a $2,000 inheritance and small savings on the salary of $55 per week which he earned as manager of a service station operated as a separate department of an automobile agency. Most of this $3,000 was held in government bonds.

The regional sales manager for the Octane Oil Company was impressed with Mr. Ernest's personal and financial qualifications, and after several interviews, a lease agreement was signed. During one of these meetings, the sales manager informed Mr. Ernest that the new porcelain-exterior service station would be completed and ready for occupancy on May 1 at a total investment cost of $60,000. Of this amount, $15,000 had already been paid for land and a total of $45,000 would be spent for a building which would be "good for about forty years." In discussing profit potentiality, the sales manager pointed out that the national advertising program of the Octane Oil Company and the consumer appeal generated by the attractive station "will be worth at least $3,000 a year to you in consumer goodwill."

The lease agreement stipulated that Mr. Ernest pay a rental of $100 per month for the station plus $0.01 for each gallon of gasoline delivered to the station by the Octane Oil Company.[3] A separate agreement was also signed whereby the Octane Oil Company agreed to sell and Mr. Ernest agreed to buy certain minimum quantities of gasoline and other products for the service station operation.

As both an evidence of good faith and as a prepayment on certain obligations which he would shortly incur to the Octane Oil Company, Mr. Ernest was required to deposit $2,500 with the Octane Oil Company at the time the lease was signed. Mr. Ernest raised the cash for this deposit by liquidating government bonds. The Octane Oil Company used most of this money to defray certain obligations incurred by Mr. Ernest to the oil company prior to the opening of the new station. The deductions from the $2,500 deposit were applied as follows:

1. Opening inventories of gasoline, oil, grease, tires, batteries and accessories	$1,475
2. Rental fee ($100 flat rental for the month of May and $45 figured at $.01 per gallon on the gasoline delivered in the opening inventory)	145
3. Down payment (on Ernest's behalf) on equipment costing $630	130
	$1,750

The equipment, including floor and hydraulic jacks, a battery charger, tune-up sets, and oil and grease guns, became the property of Mr. Ernest. A representative of the oil company stated that this equipment would last about five years. The unpaid, noninterest-bearing balance of $500 due for equipment to the Octane Oil Company was to be paid in five semiannual installments of $100 each. The first such payment was due October 30, 1952. The $750 remaining from the $2,500 originally deposited with the Octane Oil Company was returned to Mr. Ernest on April 30. He deposited this money in a special checking account he had set up for his service station venture.

Prior to May 1, Mr. Ernest wrote the following checks: $120 for office furniture which had an expected life of ten years and $60 for a fire and casualty insurance policy extending coverage for a one-year period beginning May 1. On April 30, Mr. Ernest transferred $50 from the service station checking account to the cash drawer at the service station. It was Mr. Ernest's intention to deposit in the bank all but $50 of the cash on hand at the close of each business day. The balance in the service station checking account at the start of business was, therefore, $520. In addition, Mr. Ernest had $425 in his personal savings account.

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[3] The lease, which covered a period of one year beginning May 1, was automatically renewable unless notice of cancellation was given by either party at least thirty days prior to an anniversary date. The regional sales manager of the Octane Oil Company estimated that approximately 150,000 gallons of gasoline would be delivered to Mr. Ernest's service station during the first twelve months of operation. Subsequently, Mr. Ernest's records revealed that 27,000 gallons were actually delivered during the first two months of operation.

On May 1, the service station was opened for business. In his effort to build up a clientele, Mr. Ernest worked approximately sixty hours per week compared with forty in his previous job. In addition, three other men were employed on either a full- or part-time basis. Mr. Ernest was reasonably well satisfied with the patronage he was able to build up during the first two months the station was open. At the end of June, however, he felt it would be desirable to take a more careful look at how he was making out in his new business venture. Mr. Ernest felt that he should record his progress and present position in a form which would be useful not only at the present time but also for comparative purposes in the future, perhaps at six-month intervals ending on June 30 and December 31.

Mr. Ernest maintained a simple record-keeping system in which cash receipts and cash payments were itemized daily in a loose-leaf notebook. During the months of May and June, the following cash receipts and payments had been recorded:

Cash Receipts (May and June, 1952):	
Sales of gasoline, motor oils, new and secondhand tires, batteries, accessories, revenue from lubrications, washing and polishing, and miscellaneous sales and services	$7,973
Rental from parking area on service station land	60
	$8,033

Cash Payments (May and June, 1952):	
Purchases (includes gasoline, motor oils, lubes, greases, new tires, batteries, and accessories)	$4,966
Rent (does not include $145 deduction from $2,500 deposit)	305
Payroll (does not include any payments to Mr. Ernest)	860
Utilities	57
Advertising	80
Miscellaneous	43
Withdrawals by Mr. Ernest (June 1 and June 19)	600
	$6,911

The $60 listed in cash receipts as rental from parking area had been received from an adjacent business establishment that used one portion of the service station site as a parking space for certain of its employees. The rental received covered a period extending from May 15 to July 15, 1952.

In addition to the record of cash receipts and payments, a detailed listing was kept of the amounts of money which were due from or owed to other individuals or companies. An analysis of these records revealed that $36 was due the business for gas, oil, and car servicing from a wealthy widow friend of the Ernest family who preferred to deal on a credit basis. Also, on the evening of June 30, one of the employees completed the waxing of a car for a regular customer who was out of town and would be unable to call for his car until July 3. Mr. Ernest had quoted a price of $14 for this job. Mr. Ernest recalled that when he was working at the automobile agency, he had heard that setting up a reserve for bad debts equal to 2 per cent of all outstanding accounts was a good idea.

Mr. Ernest had also jotted down the fact that he and his family had used gas and oil from the service station worth $23 at retail prices, for which no payment had been made. Approximately $18 had been paid to the Octane Oil Company for this merchandise.

A further summary of his records revealed the following unpaid bills resulting from operations in June:

Octane Oil Company for merchandise	$401
Rent payable (figured at $.01 per gallon on most recent delivery of gasoline)	20
Utilities for the month of June	55
	$476

The employees had last been paid on Saturday, June 28, for services rendered through Saturday evening. Wages earned on June 29 and 30 would amount to $21 in the following Saturday's payroll. (Disregard social security taxes.)

Mr. Ernest took a physical inventory on the evening of June 30, and he found gasoline, motor oils, lubes, greases, tires, batteries, and accessories on hand which had cost $1,113. While Mr. Ernest was figuring his inventory position, he compared his recorded gallonage sales of gasoline from daily readings of the pump meters plus the volume of gasoline on hand at the end of the period against the volume of gasoline in the beginning inventory plus deliveries. In this manner, Mr. Ernest ascertained that shrinkage due to evaporation, temperature changes, waste, and other causes amounted to 302 gallons of gasoline which he estimated had cost $59.

During the two-month period, 32 secondhand tires had been turned in by customers in return for a $1 discount off the listed purchase price of new tires. There were 8 used tires on hand on June 30, and they had not been included as a part of the closing inventory. The other 24 used tires had been sold at $0.50 each cash, and Mr. Ernest believed the remaining 8 tires could be sold at the same price.

Late in June, Mr. Ernest's married son realized that he would be unable, because of a prolonged illness, to make a payment of $48 for interest expense and $400 for principal repayment on a $1,200 bank loan. Mr. Ernest, who had acted as cosigner on the 4 per cent note, would be obliged to meet this payment on July 1, 1952.

Questions

1. Prepare a May 1 and a June 30 balance sheet for Mr. Ernest's service station and a profit and loss statement for the intervening period.

2. Be prepared to discuss, in particular, your treatment of the following events:

a) Mr. Ernest's withdrawals of $600. (Should this be treated as a reduction in owners' equity or as a wage expense? If the latter, should recognition be made of Mr. Ernest's previous salary of $55 per week, and/or his earnings from June 19 to June 30?)

b) Accounts receivable. (How much, if anything, should be provided for bad debts?)

c) The merchandise used by Mr. Ernest and his family. (Does the business make a profit on such a transaction?)

d) The $59 shrinkage of gasoline. (Should this be taken into account at all? If taken into account, should it be shown as a part of the cost of sales calculation or as an expense, or both?)

e) The secondhand tires. (Were the tires worth $1? If not, was a "sales allowance" in effect made when the new tires were sold? How much of the real selling price of the new tires appears in the figure for cash receipts from sales?)

Chapter

10

ESSENTIALS OF COST ACCOUNTING

As has already been pointed out, a common misconception concerning business figures is that there exists "the" cost of anything, a cost that can be measured with approximately the precision of the weighing scale or the tape measure. In order to understand the limitations that do exist with respect to the validity of any cost figure, the businessman needs to know something about the techniques that are used in the collection and interpretation of cost data.

Problems of Cost Determination

Why is it rarely possible to determine the precise cost of anything? The explanation is, essentially, that most total cost figures include some elements that are "common" or "allocated"; that is, they cannot be specifically assigned to the product or function that is being costed. These common or allocated costs occur for several reasons.

The first is associated with *time.* Some costs are associated with assets such as buildings and equipment which will be used over several future time periods; since the exact number of these time periods cannot usually be determined in advance, that part of the total outlay which is a cost in any one period can only be estimated. This particular difficulty is not peculiar to cost accounting but is common to all phases of accounting.

A second reason for the occurrence of common costs is associated with *function* or responsibility. Some costs are incurred for a function that is related to two or more departments, two or more products, or two or more units of the same kind of product, and it may be impossible to determine exactly the amount of the cost which belongs to one department, one product, or one unit of product. For example, some part of the factory superintendent's salary is clearly a cost of the departments he supervises, but no one can determine exactly how much of his salary is really a cost of any one department. Some part of the foreman's salary is a cost element of each product going through his department, but no one can determine exactly how much of the salary is a cost of any one unit of product. Overtime wage payments are a part of the cost of making products, but are they the cost of the particular units that happen to be manufactured in the overtime hours, or of the units that were made earlier in the day, or of all units? The allocation of a common cost to a particular function, department, or product is necessarily arbitrary to a certain extent. Making such allocations in a reasonable and equitable fashion is the peculiar problem of cost accounting.

A third reason why costs cannot be precisely determined is related to changes in the price level. Should we say that the cost of a productive asset is the amount originally paid for it, or should we say that the cost is the amount necessary to replace the asset after it has been consumed? Those who believe that "cost" means "original cost" may arrive at a substantially different cost figure under a given set of circumstances than those who believe that "cost" means "replacement cost."

Uses of Cost Information

Cost information is used in connection with the management functions described in Chapter 1: reporting the over-all status and progress of the business by means of the balance sheet and income statement, making plans, and exercising control. In addition, cost information may be used for a variety of special purposes which usually cannot be anticipated when the cost accounting system is designed. For example, cost figures are often important in litigation, such as patent suits or suits under antitrust or other federal statutes.

It is important to note that the way in which the elements of cost are put together varies with the use to which the cost figures are to be put. Consider again the factory superintendent's salary. In costing a product for inventory purposes, some fraction of the superintendent's salary is usually included. For over-all planning purposes, it is the whole amount of the salary, and not the fractions allocated to individual products, that needs to be studied. In making certain specific decisions (such as whether to buy a new machine), the salary is completely excluded from the figures; for other types of decisions (such as whether to shut down the factory), the salary is an important consideration. In evaluating performance, only those costs for which the person being judged is responsible should be included. Thus, in appraising the performance of a departmental foreman, the superintendent's salary is not an element of cost. In summary, some of these purposes require the full amount of the actual salary, some require a fraction of that amount, some require an estimate of what the amount (full or fractional) will be in the future, and some require that the amount be completely omitted.

The fact that different purposes require different cost constructions is obvious, but failure to appreciate this fact is perhaps the most important cause of the misuse of cost figures, on the one hand, and of the criticism of cost accounting systems from which these figures flow, on the other.

Since different figures are required for different purposes, it follows that basic information must be broken down and recombined in various ways. Most cost accounting systems do not develop, in the accounts, data that can be used directly for all the purposes mentioned above. In this introductory discussion of cost accounting, we shall look at systems as though they were designed for one particular purpose, that of providing figures for inventory valuation on the balance sheet and of determining cost of goods sold for the income statement. Most formal cost accounting systems—that is, systems integrated with the books of account—are designed to meet at least this purpose.

Cost Accounting and Financial Accounting

Cost accounting is not a different kind of accounting from the "financial accounting" that was discussed in earlier chapters. Rather, cost accounting is a part of the complete accounting structure of the business. It has the same rules of debit and credit and makes use of accounts, journals, ledgers, and the other techniques discussed earlier. In fact, many of the matters discussed here are nothing more than an elaboration of topics introduced in Chapter 7.

As pointed out in Chapter 7, the problem of determining cost of goods sold in a merchandising company is essentially different from the problem of determining cost of goods sold in a manufacturing company. A merchandising company (e.g., a store) sells material that has the same physical form as the material it purchases. In contrast, the material which a manufacturing company sells differs in form or shape from the material which it purchases. The cost of transforming the raw material into the finished product obviously has some bearing on the value of that finished product. A cost accounting system provides a means of determining the cost of the finished and partly finished products so that the physical units of product remaining in inventory at the end of the period can be valued and so that a dollar figure can be determined for cost of goods sold. Essentially, this is done by accumulating, for each product or group of products passing through the factory, the direct costs incurred in the manufacture of the product plus a fair share of the common costs.

Elements of Cost

Illustration 10–1 shows the elements which are frequently considered in determining the total cost of a product.

Of the elements listed, direct material, direct labor, and factory overhead have been described in Chapter 7.

Selling costs or *distribution costs* are those which are incurred in an effort to make sales and, in addition, costs incurred in handling the product after its completion and in transferring it from the factory to the customer, such as warehousing costs, billing costs, and transportation costs.

General and administrative is a catchall classification to cover items not included in the above categories. Such items are: costs incurred in the general and executive offices; research, development, and engineering costs (which may be wholly or partly included in factory overhead); public relations costs (often included in selling); donations; and miscellaneous items. In some companies, general and administrative costs are not classified separately but are considered part of the factory overhead and selling cost classifications.

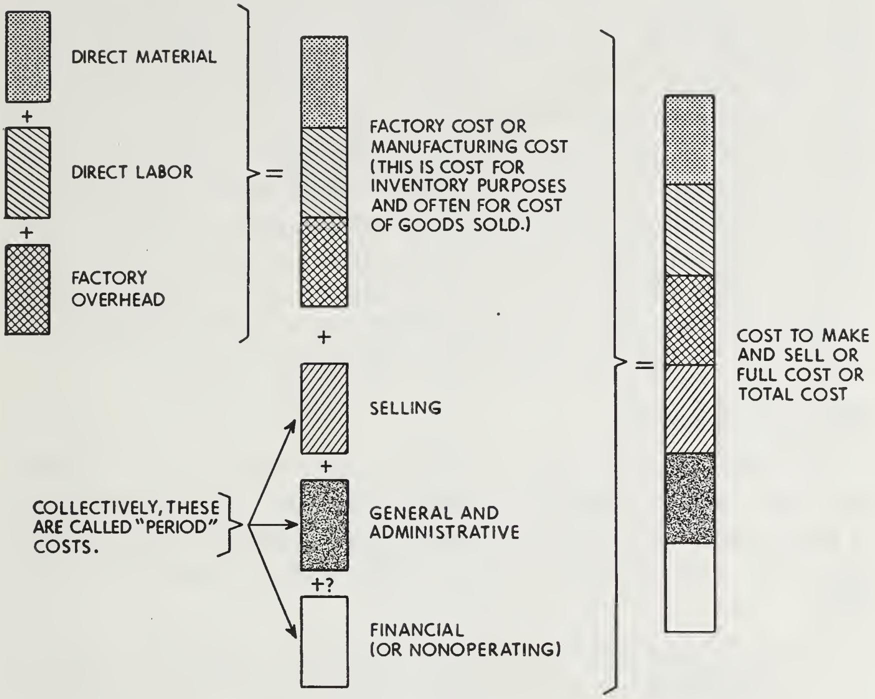
Financial costs include interest and other costs incurred in connection with borrowed capital. Sometimes these costs are included in general and administrative costs, although they are often collected separately and treated as nonoperating expenses.

As Illustration 10–1 indicates, the cost figure which is used for inventory valuation and cost of goods sold is typically the factory cost, which is the sum of direct material, direct labor, and factory overhead costs. Strictly speaking, therefore, for the purpose of determining inventory valuation and cost of goods sold, it is not necessary to determine the selling or general and administrative costs applicable to a particular unit of product; nevertheless, such a breakdown is useful for some pricing and other decisions relating to the product. However, many cost accounting systems make no attempt, as a part of the system, to segregate the selling, general, and administrative costs by units of product.

As pointed out in Chapter 7, cost elements that are used for inventory valuation are called *product costs,* and other costs are called *period costs.* The distinction is important because period costs affect net profit in the accounting period in which cost is incurred, whereas product costs

Illustration 10–1

ELEMENTS OF COSTS


DIRECT MATERIAL
+
DIRECT LABOR
+
FACTORY OVERHEAD
=
FACTORY COST OR MANUFACTURING COST (THIS IS COST FOR INVENTORY PURPOSES AND OFTEN FOR COST OF GOODS SOLD.)
+
SELLING
+
GENERAL AND ADMINISTRATIVE
+?
FINANCIAL (OR NONOPERATING)
COLLECTIVELY, THESE ARE CALLED "PERIOD" COSTS.
=
COST TO MAKE AND SELL OR FULL COST OR TOTAL COST

Variations:

1. The sum of direct material and direct labor is sometimes called "prime cost."
2. Factory overhead is also called "overhead," "burden," "indirect cost," or "manufacturing expense."
3. In "direct cost" systems, only part of the factory cost is included in inventory and in cost of goods sold.
4. Financial costs are more often than not excluded from product costs entirely.
5. Cost of goods sold is sometimes taken to mean manufacturing costs plus all or a portion of administrative and/or selling costs. The income statement will disclose whether or not this practice is followed, since if selling and administrative costs are included in cost of goods sold, they will not be shown as a separate expense item.

do not affect net profit until the period in which the product is sold, which may be a later period.

COST ACCOUNTING STRUCTURES

The Account Flow Chart

A device which is frequently used to show the structure of an accounting system is called the *account flow chart.* Such a flow chart consists of the accounts used in the system, shown in "T-account" form, with lines indicating the flow of figures from one account to another. Most accounts involved in cost accounting are either asset accounts (principally inventory accounts), expense accounts, or cost accounts (debits and credits to cost accounts are handled exactly like those to expense accounts). A characteristic common to asset, expense, and cost accounts is that increases are shown on the debit side and decreases are shown on the credit side. Since a line on a flow chart indicating a transfer "from" one account "to" another account signifies that the first account is being decreased and the second account is being increased, it follows that the typical line on a cost accounting flow chart leads from the credit side of one account to the debit side of another. In addition to the lines designating "flow," other lines indicate debit and credit entries that are generated in the production process; an example is the entry for the acquisition of raw material, which is a debit to Raw Material Inventory and a credit to Accounts Payable. Illustration 10–2 illustrates this concept and shows a typical cost accounting system.

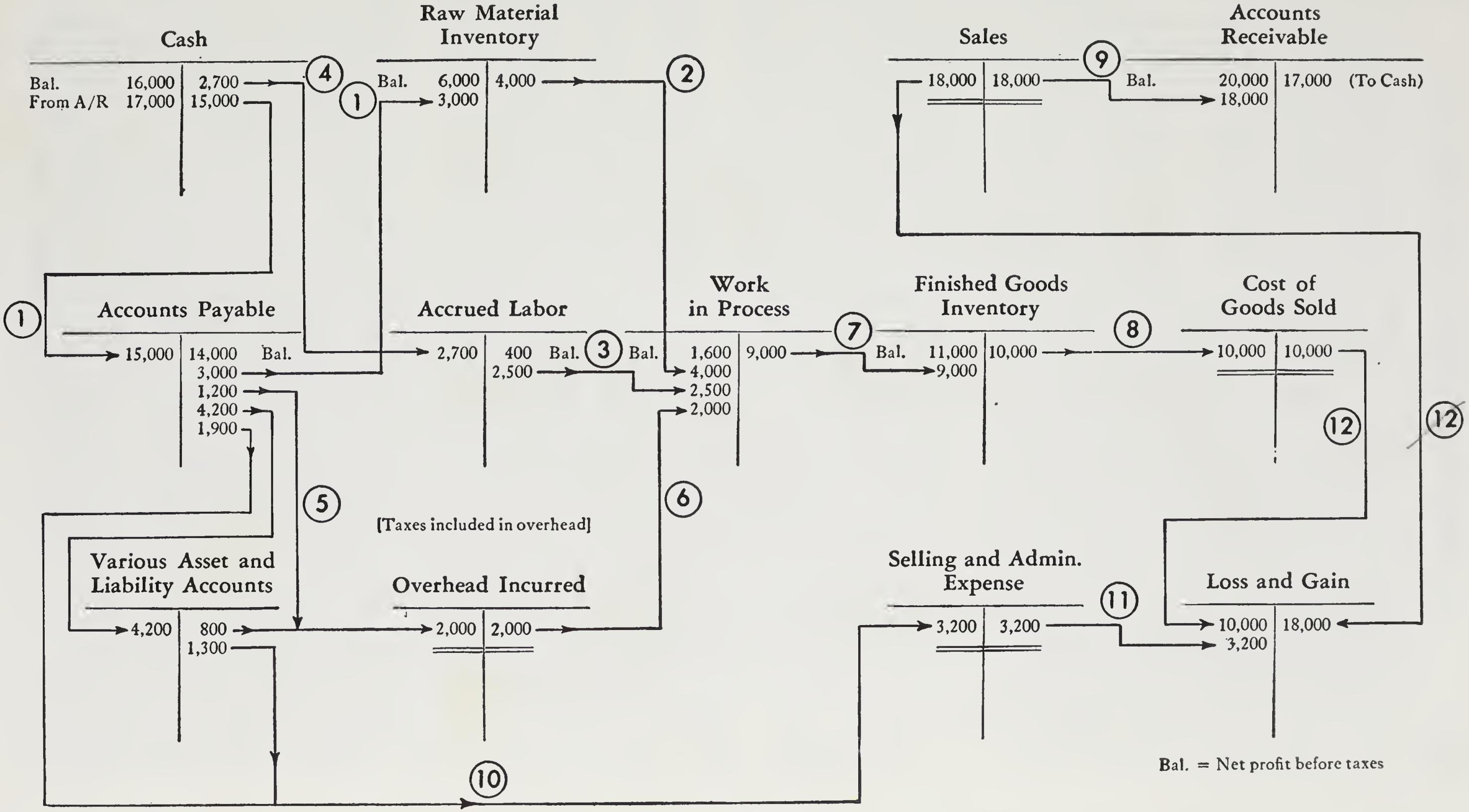
The Basic Structure

This flow chart shows a cost accounting structure in its simplest form and contains a hypothetical set of figures for a month's operation. It represents the accounts of a small company manufacturing smoking pipes. The cycle of operations shown therein may be explained as follows:

1. During the month, \$3,000 of raw material was purchased on open account, \$4,200 of other assets were purchased, and \$15,000 of accounts payable were paid. These transactions have been encountered often in the cases in earlier chapters.
2. During the month, raw material costing \$4,000 (principally briar wood, hard rubber blanks for stems, and filters) was withdrawn from inventory and sent to the shop to be worked on. This decreased Raw Material Inventory and increased the Work in Process, which, it will be recalled, is an inventory account. The balance of this account is intended to show the value of work which has been started but which has not been completed.
3. During the month, men worked on this material and fashioned it into pipes. The amount which they earned, \$2,500, was added to the value of the Work in Process, and the resulting liability was credited to Accrued Labor.
4. The men were paid \$2,700. This decreased the liability account, Accrued Labor, and also decreased Cash. (The payment of wages also involved social security taxes, withholding taxes, and certain other complications; these matters have been omitted from this introductory diagram.)
5. Factory overhead costs were incurred during the month in the amount of \$2,000. Of the total, \$1,200 was ascertained from current invoices for such things as electricity and telephone bills, or current earnings of indirect labor and supervisors. The remaining \$800, however, represented

Illustration 10–2

FLOW CHART—SIMPLE COST ACCOUNTING SYSTEM


Cash
Bal. 16,000
From A/R 17,000
2,700
15,000
Raw Material Inventory
Bal. 6,000
3,000
4,000
Sales
18,000
18,000
Accounts Receivable
Bal. 20,000
18,000
17,000 (To Cash)
Accounts Payable
15,000
14,000 Bal.
3,000
1,200
4,200
1,900
Accrued Labor
2,700
400 Bal.
2,500
Work in Process
Bal. 1,600
4,000
2,500
2,000
9,000
Finished Goods Inventory
Bal. 11,000
9,000
10,000
Cost of Goods Sold
10,000
10,000
[Taxes included in overhead]
Various Asset and Liability Accounts
4,200
800
1,300
Overhead Incurred
2,000
2,000
Selling and Admin. Expense
3,200
3,200
Loss and Gain
10,000
3,200
18,000
Bal. = Net profit before taxes
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫

Note: Circled numbers refer to events described in the text.

depreciation, the charge-off of prepaid expenses, and other credits to asset accounts or obligations credited to liabilities other than Accounts Payable. All of these items are here summed up in the general account, Overhead Incurred, but in practice they are usually shown in separate overhead cost accounts, one for each type of cost.

6. Since the overhead cost was considered as being a part of the cost of the pipes that were worked on during the month, the total overhead incurred was transferred to Work in Process.
7. Pipes whose total cost was $9,000 were completed during the month and were transferred to Finished Goods Inventory. This resulted in a decrease in Work in Process and an increase in Finished Goods Inventory.
8. Pipes with a cost of $10,000 were sold during the month. Physically, these pipes were removed from inventory and shipped to the customer. On the accounting records, this was reflected by a credit to Finished Goods Inventory and a debit to Cost of Goods Sold.
9. At the same time, and for the same products, sales revenue of $18,000 was created, and this was shown on the books by a credit to Sales and a debit to Accounts Receivable. Later on, these receivables were paid, thus resulting in a debit to Cash and completing the accounting cycle. It should be particularly noted that the Sales transaction described here and the Cost of Goods Sold transaction described in Item 8 related to the same physical products. The difference between the balances in Sales and Cost of Goods Sold, $8,000, therefore represented the gross margin earned on products sold during the month.
10. During the month $3,200 selling and administrative expenses were incurred, $1,900 of which represented credits to Accounts Payable and $1,300 credits to various asset and liability accounts.
11. Since these were expenses applicable to the current period, Selling and Administrative Expense was closed to Loss and Gain.
12. The balances in Sales and Cost of Goods Sold were also closed to Loss and Gain, and Loss and Gain then showed the net profit for the period. This is a somewhat oversimplified statement, for income taxes and certain nonoperating and financial items which would appear in many income statements have not been considered.

The necessity for product cost accounting can be demonstrated by further reference to transaction No. 7, which involved the $9,000 transfer from Work in Process to Finished Goods. The number and kinds of physical units (pipes) involved in this transfer could be more or less readily ascertained, but in order to convert these physical units into a dollar figure it was necessary that a cost per unit be established. If the factory made only one product, it would have been possible to divide the total debits to Work in Process by the total number of units worked on which would have given a close approximation of the cost per unit; this figure could then have been used to calculate the amount to be transferred from Work in Process to Finished Goods Inventory.

If the factory made more than one kind of product, however, such a simple calculation would not have given results that fitted the facts, since one product probably used more material, labor, or overhead—that is, it cost more—than another. If the entry transferring completed products from Work in Process to Finished Goods Inventory is to reflect the facts of the situation, some method of taking these differences into account must be used. One method of doing this is to collect separately the unit cost of each different kind of product. The unit cost of each type of product multiplied by the number of such products that were transferred to Finished Goods Inventory gives the dollar figure required for transaction No. 7; the same unit cost figure can be used as a basis for the entry transferring that type of product from Finished Goods to Cost of Goods Sold.

Job Costing and Process Costing

Nothing has been said thus far concerning the records and procedures which are necessary to collect the detailed information as a basis for recording the transactions shown in Illustration 10–2. The two common systems used for this purpose are called, respectively, *job costing* and *process costing.*

A pure *job cost* system is one in which the costs are collected for each individual job[1] worked on. Usually the costs are collected on a separate form that is provided for each job. It can be readily seen how this form fits into the scheme outlined in Illustration 10–2. The "job cost sheet," as it is called, contains places to record the material, labor, and overhead costs assigned to the particular job during the accounting period. The sum of all the material, labor, and overhead costs incurred by all the jobs worked on in the factory during a period is the basis for the entries debiting Work in Process and crediting inventory, wages, and overhead accounts. When the job is completed, the total cost recorded on the job cost sheet is the basis for the entry transferring the product from Work in Process to Finished Goods Inventory, and this same cost is the basis for the entry transferring the product from Finished Goods Inventory to Cost of Goods Sold when the product is sold.

A pure *process cost* system does not attempt to collect costs for individual units of product, as these units travel through the factory; instead all costs incurred in a given time period, such as a month, are collected without reference to specific units of product. This system is used in a factory making only one product, such as cement, or in a factory where the difference between various types of products is not substantial; that is, where the products are relatively homogeneous. Essentially, in a process cost system the total cost incurred during the period and the total number of units of products worked on during the period are collected. By dividing total costs by total units, one derives the cost per unit; and this cost per unit is used as the basis of valuing the units transferred to Finished Goods Inventory and, later on, from Finished Goods Inventory to Cost of Goods Sold.

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[1] A "job" may mean one unit of product (e.g., a turbine or a house), or it may mean many units of identical or similar products covered by a single production order (e.g., books or shirts). When the job consists of more than one unit of product, the system is often called "job-lot costing" or simply "lot costing."

The 50% Assumption. Units *worked on,* as used in the preceding paragraph, include both units completed during the period and units in process at the end of the period. In many process cost systems, it is assumed that units still in process at the end of the period are, on the average, 50 per cent completed. Thus, in calculating the labor and overhead costs per unit worked on, each unit completed would be given a weight of one, each unit in process at the end of the period would be given a weight of one half, and each unit in process at the beginning of the period would also be given a weight of one half. For example, if 200 units were completed, 50 units were in process at the end, and 10 were in process at the beginning, the number of whole units worked on would be $200 + {}^{50}\!/_{2} - {}^{10}\!/_{2} = 220$. If total costs incurred were $2,200, costs per whole unit would be $10 and each of the 50 units in process at the end of the month would be costed at $5.[2]

In a process cost system, raw material would be costed according to its physical flow. If material were added evenly throughout the production process, it could reasonably be costed by use of the 50 per cent assumption described above. If, as is perhaps more common, all the raw material for a unit were issued at the beginning of the process, material cost per unit would be obtained by dividing the total cost of material used by the number of units *started* during the period.

For our purposes, there is no necessity for studying the detailed differences between job costing and process costing. Both systems are essentially devices for collecting information. Either one of them could have been used in connection with the basic structure shown in Illustration 10–2. In practice, companies often use systems that combine some features of job costing and some features of process costing.

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[2] A common variation on this procedure is to disregard the units in process. If the work in process inventory is small, or if it remains relatively constant in size, no serious error is introduced. Another variation is to apply the 50 per cent assumption separately to each department through which the product passes rather than to the factory as a whole.

Standard Costs

The basic objective of the system outlined in Illustration 10–2 was to charge units of product with the *actual* costs incurred in making these products. Many cost accounting systems are based wholly or in part on the principle that the costs charged to individual products are the costs which *should have been incurred* on those products rather than the costs which *actually were incurred.* Such a system is called a *standard cost system.* The essential nature of standard costs is that they represent costs which should have been incurred rather than costs which actually were incurred.[3]

Illustration 10–3 shows the same cost accounting system described in Illustration 10–2 except that the system has been shifted to a standard cost basis. It will be noted that the only difference between this system and that shown in Illustration 10–2 is that three *"variance"* accounts have been added. Standard costs are usually different from the actual costs incurred, and the variance accounts are a repository for the differences. For example, if actual labor costs for the month were $2,500, the credit to the liability account Accrued Labor must obviously be $2,500. If the standard labor costs of the operations performed totaled only $2,100, Work in Process would be debited for $2,100. The difference of $400 is debited to the Labor Variance account. Entries to variance accounts are debits if actual costs are greater than standard costs, and they are credits if actual costs are less than standard costs.

There are several reasons why a standard cost system may be used. In the first place, it is often simpler and requires less work than an actual cost system. This is so because once the standard cost for a unit of product has been determined, this cost remains unchanged, and it is not necessary to calculate the cost of each separate unit that goes through the plant. In the second place, an actual cost system often produces different costs for units of product which are physically identical. For example, in our pipe factory there may be two equally efficient men making identical sizes and shapes of pipe bowls. If one man, because of seniority or other reasons, has a higher wage rate than the other, under an actual cost system the pipes which he makes would have a higher labor cost than the pipes the second man makes. A standard cost system usually gives, for inventory and cost of goods sold purposes, identical unit costs for products which are physically identical. In the third place, such a system provides the beginning of a mechanism for checking on the efficiency with which the work was done in that the balance in the variance account is supposed to represent the difference between the costs that *should have been* incurred and the costs that *actually were* incurred. The validity of this statement, of course, depends on the accuracy with which the standard cost actually measures what should have been incurred; this point will be discussed in more detail in Chapters 14 and 15.

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[3] Some accountants limit the term "standard costs" to costs determined on the basis of engineering estimates and use the term "estimate costs" for costs determined on the basis of estimates made by persons who are not engineers. As a practical matter, the distinction is not of great significance.

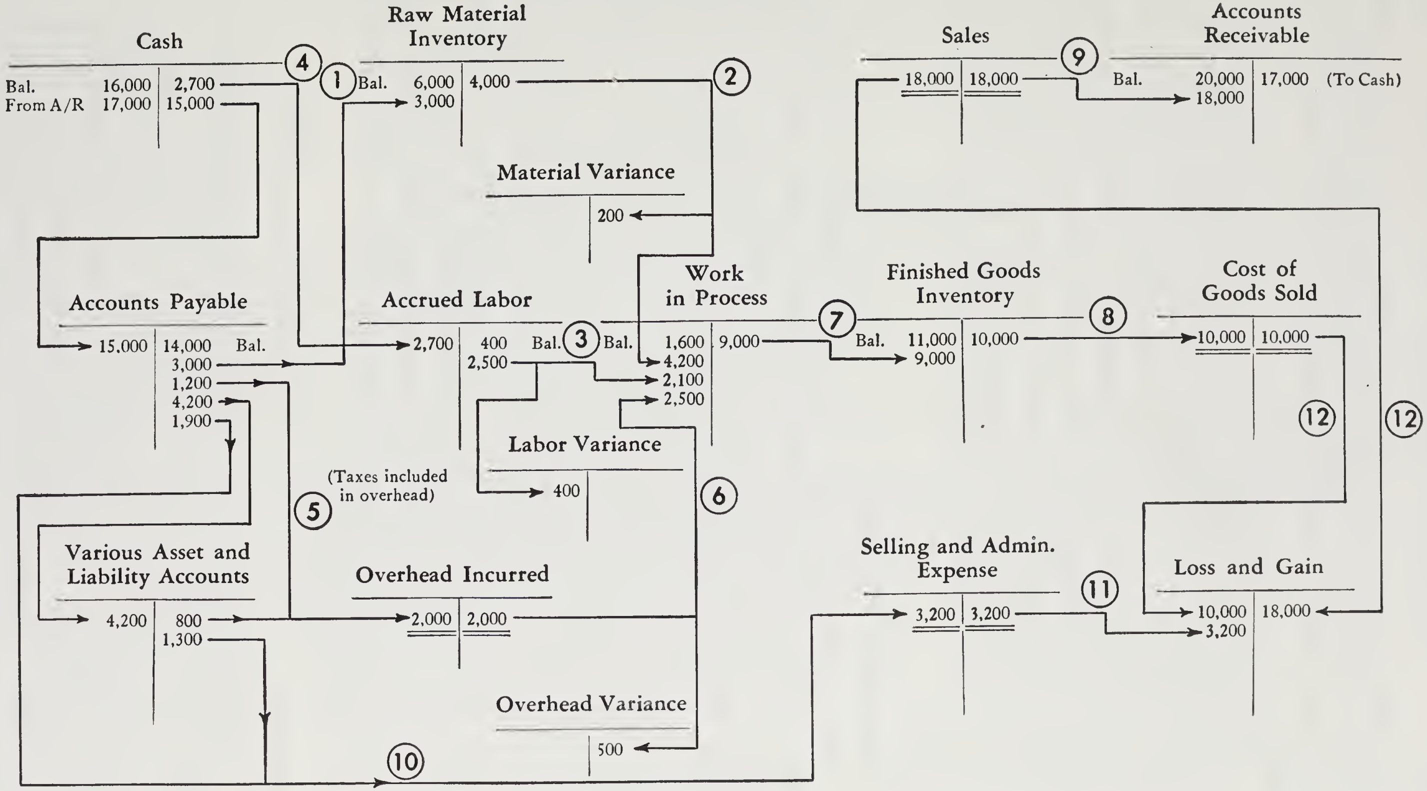
Companies which use standard costs do not necessarily use a *complete* standard cost system, that is, a system which treats all elements of cost on a standard basis. It is quite common for companies to calculate material and labor cost on an actual basis but to use a so-called *burden rate* for the allocation of overhead costs. Whether or not such a burden rate can really be classified as a standard cost is immaterial, but a burden rate at least resembles a standard cost in that it is a measure of what the burden costs per unit of product or per some other unit are expected to be.

Standard costs may be inserted into the system at any one of several places. For example, material may be taken up in Raw Material Inventory at a standard price, with the difference between actual purchase price and the standard price being entered in a Raw Material Price Variance account; in Illustration 10–3 this account would be placed to the left of the Raw Material Inventory account. Another alternative is to charge all elements of cost into Work in Process at actual; the conversion to a standard cost basis would then be made between Work in Process and Finished Goods Inventory. In the latter system, the variance account would occur between Work in Process and Finished Goods Inventory. The essential point is that one or more variance accounts are inserted in the system at whatever point the shift from actual to standard is made.

The variance accounts may or may not be closed at the end of the accounting period. Companies that leave variance accounts open from one period to another do so with the expectation that over a period of time unfavorable variances will be offset by favorable variances, and the balance in the account will therefore become zero. If the variance accounts are closed, they may be closed either to the inventory accounts, to Loss and Gain, or to some other income statement account; or part of the variance may be closed to inventory and the remainder to an income statement account. This difference in treatment is another example of the distinction between product costs and period costs. If the variance accounts are closed to inventory, they affect the cost of the product, and

Illustration 10–3

A STANDARD COST SYSTEM


Cash
Bal. 16,000
From A/R 17,000
2,700
15,000
Raw Material Inventory
Bal. 6,000
3,000
4,000
Material Variance
200
Accounts Payable
15,000
14,000 Bal.
3,000
1,200
4,200
1,900
Accrued Labor
2,700
400 Bal.
2,500
Work in Process
Bal. 1,600
4,200
2,100
2,500
9,000
Labor Variance
400
(Taxes included in overhead)
Various Asset and Liability Accounts
4,200
800
1,300
Overhead Incurred
2,000
2,000
Overhead Variance
500
Sales
18,000
18,000
Accounts Receivable
Bal. 20,000
18,000
17,000 (To Cash)
Finished Goods Inventory
Bal. 11,000
9,000
10,000
Cost of Goods Sold
10,000
10,000
Selling and Admin. Expense
3,200
3,200
Loss and Gain
10,000
3,200
18,000
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑫

Note: Circled numbers refer to events described in the text.

Bal. = Net profit before taxes

thus affect net profit only in the accounting period in which the product is sold. If they are closed to Loss and Gain, they affect net profit in the accounting period in which the variances occur, which may be an earlier period.

Having made a distinction between standard costs and actual costs, it should again be pointed out that in most situations, for reasons given at the beginning of this chapter, there is no way of determining "actual" costs in any precise sense of the word. The indirect or overhead elements in an actual cost system must, by definition, be allocated or prorated to products, and although this is done on what seems to be a reasonable or equitable basis, the resulting product cost represents at best a *fair share* of all costs incurred in the factory rather than a literal statement of the costs actually incurred in making the product to which the costs are assigned.

Variations in Practice

The accounting systems outlined in Illustrations 10–2 and 10–3 will probably never be precisely duplicated in actual practice. The systems shown in these figures are schematic representations of underlying structures. Companies build on the basic structure by adding accounts which collect the information in more detail so as to meet their particular needs for information. A company may, for example, set up several inventory accounts, each one covering a different kind of material, instead of the single account shown in Illustration 10–2. Another common variation is to have several work in process accounts, one for each main department or "cost center" in the factory. A system using several work in process accounts is shown in Illustration 10–4. It will be noted that such a system is essentially like that shown in Illustration 10–2 except that work is transferred from one department to another and the finished goods of one department become, in effect, the raw material of the succeeding department.

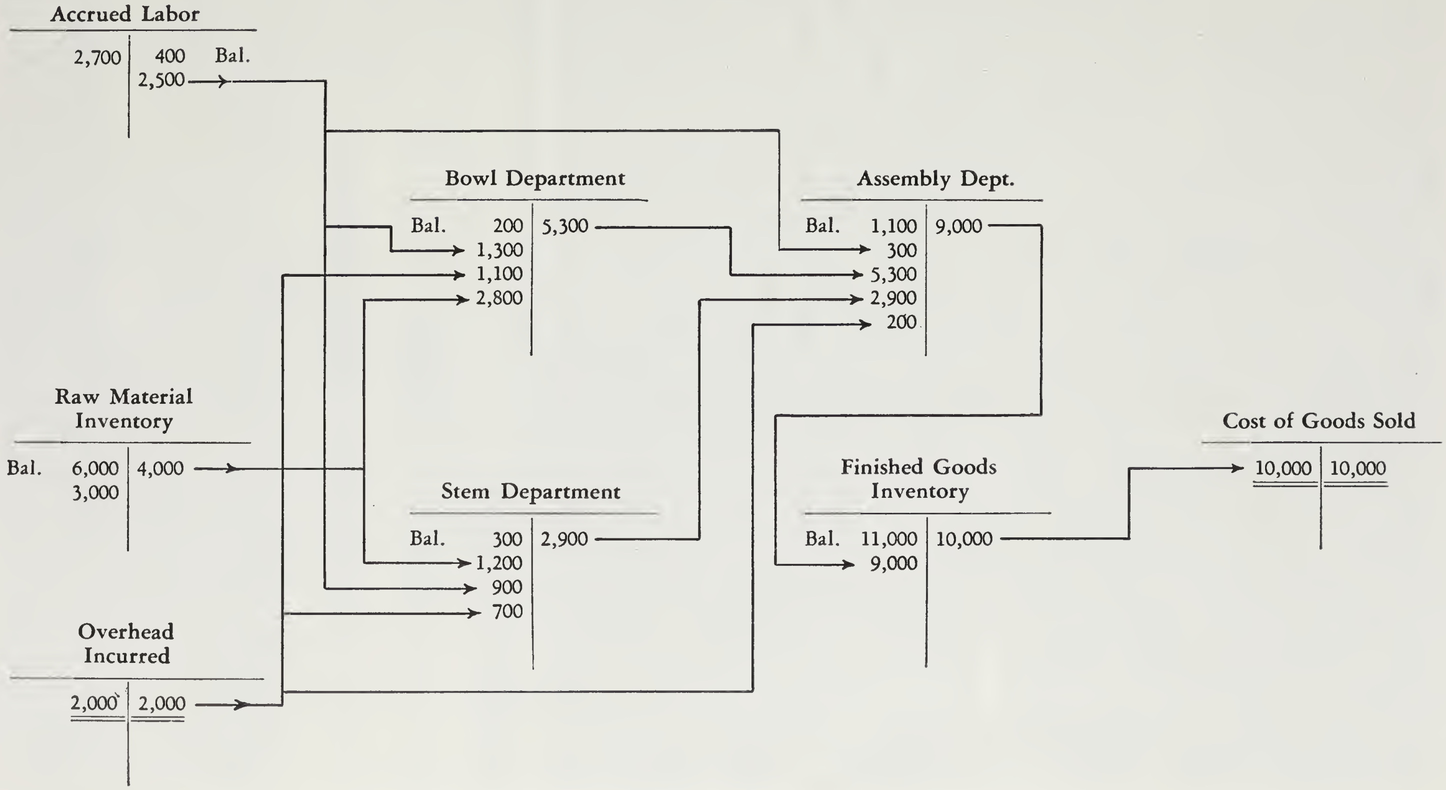
Summary

By way of summary, the methods used to determine inventory valuation in various types of cost systems will be repeated.

In an actual cost system, the objective is to value products in inventory at the actual direct costs incurred in making them plus a fair share of indirect costs related to the manufacturing process. There are two general types of actual cost systems, job costing and process costing, although a company often uses a mixture of both types. In a job cost system, units of product in finished goods inventory are valued at costs

Illustration 10–4

COST SYSTEM WITH SEGMENT OF DEPARTMENTAL PROCESS ACCOUNTS



Accrued Labor
2,700
400 Bal.
2,500
Raw Material Inventory
Bal. 6,000
3,000
4,000
Overhead Incurred
2,000
2,000
Bowl Department
Bal. 200
1,300
1,100
2,800
5,300
Stem Department
Bal. 300
1,200
900
700
2,900
Assembly Dept.
Bal. 1,100
300
5,300
2,900
200
9,000
Finished Goods Inventory
Bal. 11,000
9,000
10,000
Cost of Goods Sold
10,000
10,000

accumulated for each unit, or lot, on a job cost sheet; and partly completed units of product (i.e., work in process) are valued at costs accumulated on job cost sheets for material used and operations performed up to the end of the accounting period. In a process cost system the number of units worked on is divided into the total costs incurred by the factory or department in an accounting period to give a cost per unit. An allowance may be made for partly completed units by assuming that they are, on the average, 50 per cent completed.

In a standard cost system, the objective is to value products in inventory at a standard representing what they should have cost. For finished goods inventory, a standard cost for the completed products is determined. Partly completed units are valued at standard material cost plus the standard cost of the operations performed up to the end of the accounting period, or, alternatively, as in actual process costing, on the assumption that the goods are 50 per cent completed. Variances between actual and standard cost may be charged either to Loss and Gain or to inventory. If the latter method is followed, inventory values in a standard cost system are similar to those in an actual cost system.

Finally, it should be emphasized that many companies do not have a cost accounting system. In his introduction to the 1946 OPA study of 187,370 companies previously referred to, Mr. Paul M. Green says: "Probably 85% of all industrial companies do not allocate cost on a product basis, and 15% are readily able to produce such information. I believe that I am very optimistic when I estimate that as much as 25% of total production would be [covered by a cost accounting system]."[4] Although there has been a considerable increase in the use of cost accounting since 1946, it has by no means been extended to include all manufacturing companies.

CASES

CASE 10–1. CONN COMPANY

The Conn Company made custom bodies for trucks. Occasionally a buyer would want an exact duplicate of a particular model that the company had built before, but most of the time there were some differences that affected design and cost. Therefore, in order to keep track of costs, each job was analyzed separately.

When a job was started it was given a code number, and costs for the job were collected weekly under that code number. When material

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[4] United States Office of Price Administration, *A Report on Cost Accounting in Industry,* 1946.

(such as wood, metal tubing, steel forms or bars, canvas, paint, etc.) used for a particular job was issued to the workmen, a record of the quantity issued was obtained on a requisition form. This quantity of material—so many units, board feet, linear feet, pounds, etc.,—was multiplied by the purchase cost per unit to arrive at the actual cost of material used. By keeping a cumulative record of these withdrawals by code number, the total material cost of each job was easily determined.

Likewise all labor costs of making a particular truck body were recorded. If a man moved from job to job, a record was made of the time spent on each job, and his week's wage was divided among these jobs in proportion to the way he had spent his time. Throughout the shop, the time of any person working on anything directly related to Job No. 1375J, for example, was ultimately converted into dollar cost and charged to that job.

Finally those factory costs that could not be directly associated with a particular job had to be divided among all jobs on some reasonable basis. In the Conn Company these overhead costs were allocated to jobs on the basis of the relative number of direct labor hours involved. Thus, if in any month 135 direct labor hours were spent on Job No. 1375J, and this was 5 per cent of the 2,700 direct labor hours spent on all jobs together, then Job No. 1375J was charged with 5 per cent of all the indirect costs—supplies, salaries, depreciation, etc.,—for that month.

Under this system of recording costs, the management of the Conn Company knew at the end of every month what each body job in process had cost to that date, and when the work was completed it knew the total factory cost, and therefore the gross profit on that particular job.

Questions

1. Try to visualize the various documents necessary to keep track of Conn Company costs. Does the amount of clerical work seem large?

2. Do you think the Conn system would work satisfactorily in an automobile factory?

3. List the possible reasons why the accounting costs could be different on two physically identical truck bodies built at different times.

4. Do you think it would have been better if overhead costs had been allocated to each job as a fixed percentage of direct labor costs (e.g., 120 per cent), the exact percentage to be set each year on the basis of the preceding year's experience?

CASE 10–2. FOSTER BODIES, INC.

Foster Bodies, Inc., manufactured truck bodies of standard design. The company had twelve different models, and these were produced in quantity as indicated by management's estimates of demand. In December of each year a plan for the next year's operations was agreed upon. This plan, or "budget," included estimates of costs and profits as well as of sales volume.

The budget included cost estimates for each of the twelve models of truck bodies. Essentially the estimates were arrived at by figuring on so much labor at a certain expected wage, plus so much material at an expected price, plus so much overhead at an expected percentage relationship between overhead costs and direct labor costs. The estimate for each model was referred to as the "standard cost" of the model.

No attempt was made in the accounts to record the actual costs of each model, but costs were carefully accumulated for each of the four direct producing departments and for five service departments. Labor costs were easily obtainable from payroll records since all employees assigned to a producing department were classified as direct labor for that department. Material sent to the department was charged to it on the basis of signed issue slips. Overhead costs were charged to the department on the basis of the same percentage of direct labor that was used in arriving at the standard cost.

Since the company also knew how many truck bodies of each model were handled by each department each month, the total standard costs for each department could easily be calculated by multiplying the standard cost of each model by the quantity of that model worked on. Management watched closely the difference between the actual cost and the standard cost as the year progressed. Work was so scheduled that no incomplete work was left in a department at the end of a month.

As each truck body was completed, its cost was added to Finished

Exhibit 1

FOSTER BODIES, INC.

Summary of Costs, Department 2, June 1956

	Number of Bodies	Material		Labor		Overhead*	
		Per Unit	Total	Per Unit	Total	Per Unit	Total
Standard Costs:							
Model 101.....	10	$ 80	$ 800	$115	$1,150	$115	$1,150
108.....	8	110	880	80	640	80	640
112.....	11	150	1,650	130	1,430	130	1,430
147.....	20	60	1,200	123	2,460	123	2,460
Total.......	49		$4,530		$5,680		$5,680
Actual..........			4,960		5,910		5,910
Variance....			$−430		$−230		$−230

* The overhead rate in 1956 for Department 2 was 100 per cent of direct labor cost.

Goods Inventory at the standard cost figure. When the truck body was sold, the cost of sales figure was that same figure. This system of cost recording avoided the necessity of accumulating detailed actual costs on each specific body built, yet the company could estimate, reasonably well, the costs of its products. Moreover, the management believed that the differences (or "variances," as they were called) between actual and standard cost provided the basis of a revealing insight into cost fluctuations that eventually should lead to good cost control.

An illustrative tabulation of the June, 1956, costs for Department 2 is shown in Exhibit 1.

Questions

1. How does the cost system used by this company differ from that of the Conn Company?
2. What possible reasons might occasion the cost differences (i.e., variances) between actual and standard?
3. Describe how the standard cost of factory overhead for a particular model might be estimated for the purpose of preparing the budget.
4. What paper records would be needed to operate this cost system?

CASE 10–3. DAVIGO FOODS COMPANY

The Davigo Foods Company, located in a tomato growing section, had for many years produced tomato specialties such as tomato juice cocktail, tomato paste, and ketchup. In 1953 it was able to extend its production season from four to nine months by the addition of various types of prepared spaghetti dinners and ravioli. In order to keep certain skilled personnel, the company had found a place for five men in the shipping department during the three months when the remainder of the plant was closed.

These men had been earning a wage of $1.30 an hour at their regular work, but they were willing to accept $0.97 an hour for the time they were in the shipping department. This meant that during the three months they were in the shipping department the five men had collectively received $860 less than they would have received at their regular rate of pay. However, the regular wage rate in the shipping department was $0.80 per hour, and the shipping department therefore had been charged with $440 more than it ordinarily would have paid for this type of work.

The head of the shipping department was indignant that his costs were increased by this amount and contended that he should be charged at a rate not higher than the regular $0.80 rate for his department and that a fairer rate would be the beginners' rate of $0.65, since these men were not as efficient as his experienced work force.

Question

1. How would you account for the $0.97 per hour paid the five men when they worked in the shipping department?

CASE 10–4. DIXON COMPANY

The Dixon Company made metal parts and subassemblies for approximately a dozen manufacturers in the Detroit area. Prior to 1946, all of this work had been done on a fixed-price basis. In 1946, the company negotiated a contract with the Mayer Company, a large manufacturing company. Under the terms of this contract, the Dixon Company would devote roughly 40 per cent of its output to parts for the Mayer Company. The exact nature and volume of these parts was to be determinded subsequently. Payment was to be made on a basis of cost plus a fixed fee. "Cost" was to be the sum of the direct material, direct labor, and overhead cost of the parts. The overhead cost was to be calculated as that percentage of direct labor which total overhead in the plant bore to total direct labor. A tentative overhead rate was to be set for billing purposes, and an adjustment was to be made at the end of each year after actual overhead costs and actual direct labor costs for the year had been determined.

The Dixon Company used a simple cost accounting system under which most payments to employees were classified as direct labor. This classification was not satisfactory to the representative of the Mayer Company, and he suggested that the classification should be governed by the definition contained in the government publication *Explanation of Principles for Determination of Costs under Government Contracts,* which reads as follows:

> Direct labor cost consists of wages paid for labor performed on and properly chargeable directly to the article manufactured. Such wages should be taken at the individual hourly rates actually paid, or, if a piece-work or other incentive plan of wage payment is customarily followed by the contractor, at such incentive rates actually paid. Special premiums, bonuses, and overtime payments, if treated as direct labor costs, should be separately stated. Furthermore, if direct labor cost is the basis of overhead apportionment, such special premiums, bonuses, and overtime payments should not be included in the base for the distribution of overhead.
>
> Direct labor may also include compensation insurance and old age benefit and social security taxes pertaining to such employment.
>
> It is recognized that complete uniformity in the definition of direct labor

does not exist even within single industries, and that therefore certain operations may be included by one contractor under direct labor and by another contractor under indirect labor. This difference is not material for the purpose of ascertaining cost under a particular contract, as a contractor's practice will be acceptable if it is in accordance with sound accounting procedure, and if it is uniform throughout his own activities.

The treasurer of the Dixon Company thought that further discussion of this topic would be desirable. Consequently, he prepared, with the assistance of his chief accountant, a list of the types of labor payments likely to be incurred during the life of the contract. Recognizing that the magnitude of the expense would enter into the discussion, he included a rough estimate of the monthly anticipated cost to the Dixon Company for each type of labor. This list, which was to be used as a basis for discussion, follows:

1. Earnings of piece-rate workers (approximately $25,000).
2. Earnings of day-rate workers who worked on productive work (approximately $3,000).
3. Overtime payments (impossible to estimate, depends on delivery requirements of Mayer Company).
4. Payments to workers who for some reason or other were idle (approximately $1,250).
5. Payments for time spent setting up machines (very roughly $2,000).
6. Payments to workers for regular work time used in attending union meetings (approximately $200).
7. Payments to foremen and assistants (approximately $1,800).
8. Payments to inspectors (approximately $600).
9. Payments to office workers (approximately $2,600).
10. Payments to sweepers (approximately $450).
11. Payments to maintenance men (approximately $600).
12. Payments to man employed in the raw material stockroom ($275).
13. Allowance for vacation pay (all of the above employees had one week's vacation with pay each year).
14. The company's contribution to old age benefit taxes (approximately 1 per cent of all wages paid).
15. The company's unemployment insurance tax (approximately 2 per cent of all wages paid).

Questions

1. Should the treasurer of the Dixon Company be concerned about this matter? Why?

2. In your opinion, which types of payments on the above list should be classified as direct labor and which should be classified as indirect labor and, therefore, included in overhead?

3. Comment on the usefulness of the definition quoted in the case. Should it be made more precise?

CASE 10–5. TREYNOR COMPANY

The Treynor Company had a standard cost system with separate accounts established to record factory variances. Variance accounts were closed at the end of the month to the Loss and Gain account.

Two products were made, each with a standard cost for 1955 as follows:

	Product A	Product B
Direct material cost (at standard cost of $1 per pound)	$ 5	$ 8
Direct labor cost (at standard rate of $1 per hour)	20	12
Overhead cost	10	20
Total	$35	$40

Raw material cost was debited to the Raw Material Inventory account at the standard cost of $1 per pound upon delivery, any discrepancy between actual and standard price going to a variance account. All debits to Work in Process were at standard.

Following are statements relating to operations in September, 1955:

a) On September 1, balances in the inventory accounts were as follows:

Raw Material	$12,000
Work in Process	35,000
Finished Goods	43,000

b) During September, the company bought and received 20,000 pounds of material, paying $12,000 cash of the total bill of $23,000, leaving $11,000 still payable.

c) Direct labor expense incurred during September was $30,000. Indirect labor expense was $10,000. (Disregard the entry for the payment of wages.)

d) Production schedules for September called for 800 units of A and 1,200 units of B to be started through production during the month, and these were, in fact, started. To provide for this volume of production, 15,000 pounds of material were used during the month.

e) Overhead expenses for September other than indirect labor were $25,000. (Assume that the offsetting entry was to Accounts Payable.)

f) Administrative and selling expenses were $20,000. (Assume that the offsetting entry was to Accounts Payable.)

g) Standard cost sheets showed that standard costs were charged to products, representing work done on those products during the month as follows: labor, $30,400; overhead, $32,000.

h) During September, 1,100 units of A and 1,000 units of B were delivered to the warehouse as finished goods, although some of this production had in fact been started in August.

i) September sales were 1,000 units of A for $53,000 and 1,200 units of B for $65,000. (Assume that the offsetting entry was to Accounts Receivable.)

Questions

1. Set up T-accounts and record the above transactions. Adjust and close the accounts, carrying the process through to the transfer of September's net profit to Retained Earnings.
2. Prepare an income statement for September.
3. What were the balances in the inventory accounts as of September 30?
4. Why is your figure for the profit in September only a rough approximation at best?

CASE 10–6. LAREN MANUFACTURING COMPANY

In September, 1953, Mr. James Laren, Jr., was asked to investigate the possibility of instituting new methods of cost control in the Laren Manufacturing Company, which was owned by his father. Mr. Laren, Sr., keenly felt the need for better cost control because his small plumbing and pipefitting equipment firm competed on a price basis with large corporations who were firmly entrenched in the market.

James Laren decided to start his investigation in the company's valve department because this department produced almost one third of the company's total volume of sales. The valve department contained drilling and grinding machines, lathes, welding equipment, and assembly space. In this department all the operations necessary to produce and assemble valves were performed. Exhibit 1 is a floor plan of the department. As shown in the floor plan, the department was divided into a number of sections. Exhibit 2 describes the functions of these sections, each of which was under the supervision of a leadman.

Exhibit 3 indicates the flow of production through the various sections of the valve department. Valves in the standard line went through Sections 1, 2, 3, and 5. Special valves (i.e., valves not in the standard line) went through all five sections. Pieces produced for spare parts inventory did not go through Section 5 (Assembly). In addition, any section of the valve department might perform some operations on products for other departments of the Laren Manufacturing Company.

Mr. Laren's investigation showed that all factory costing in the valve department (except material costs) was done on a department-wide, direct-labor-hour basis; that is, each lot of products going through the department was costed at a certain rate for each direct labor hour actually spent on the lot. Exhibit 4 shows the computation made to arrive at the cost figure of $2.88 which was the rate per labor hour in the whole department in August, 1953. Costs were accumulated and allocated to jobs each month.

Mr. Laren, Jr., did not feel that this method of obtaining and apportioning costs was accurate enough. He believed that problems could arise in trying to judge performance and to obtain the true cost of different products by following this method. He proposed, therefore, that costs be collected monthly for each section of the department and that these costs be apportioned to jobs according to the amount of time spent in each section.

In order to study the effect of this proposal, Mr. Laren recomputed the costs for August so as to show the costs applicable to each section. Since direct labor charges were already being collected by sections, no change in procedures was necessary for the collection of labor costs. Some overhead items, such as leadman wages, could be charged directly to the section in which they were incurred. Other overhead charges, such as heating and lighting, were allocated on bases that seemed to Mr. Laren to be reasonable. He divided the total overhead costs charged to each section by the number of labor hours worked in the section, and arrived at costing rates for each section. These are shown in Exhibit 5.

Mr. Laren made the following observations in support of his proposal for revising the costing rates. One of the largest volume items produced by the department was Valve 301. A standard production run of Valve 301 required the following hours in the different sections of the department:

Section	*Hours*
Section 1	15
Section 2	10
Section 3	65
Section 5	40

Mr. Laren said that there was obviously a wide difference between the cost for this valve as figured under the present system and the cost as figured under his proposed system. His contention was that the present method led to false conclusions as to the profitability of a line.

Mr. Laren also saw problems in the valuation of the spare parts inventory produced by the valve department. The company produced a wide line of valves, and it was necessary to maintain an inventory of spare parts in order to be able promptly to supply repair parts to customers. The following amounts of time were usually spent on producing spare parts for inventory each month:

Section	*Hours*
Section 1	160
Section 2	145
Section 3	560

When Mr. Laren's proposal was explained to the heads of the operating departments, it met with immediate and strong opposition. First to voice disapproval were the heads of other departments that had work totaling the following amounts done by the valve department each month:

	Hours
Welding (Section 1)	350
Grinding (Section 2)	250
Machining (Section 3)	1,100

These supervisors thought that it was unfair to change a sizable part of their department's costs, especially since they had no control over the costs incurred in the valve department.

Mr. Ahearn, foreman of the pipe fixture department, was very much against the proposal: "The valve department does the machining work on all the work that my department can't handle. If you raise my costs on this work, I'll never be able to stay within my budget, because the valve department is already charging me more than I could do the work for in my own department if I had the capacity."

The sales manager was also against the proposal: "If you start monkeying around with our cost system, we'll have to start changing our prices, and we're having enough trouble with price competition from the major companies as it is. After all, our complete valve line is showing a profit. You have to carry some items for sales reasons regardless of their profitability, so why worry about the very small variation in cost between different items."

The foreman of the valve department also opposed the change: "I'm too busy to fool with more paperwork. It takes all my time to get the production out without trying to keep up with this stuff, section by section. And my leadmen in the sections don't have time for it either. The department is carrying all its costs now, so why put in an extra gimmick?"

Mr. Laren, Sr., remained neutral on the question. He was most interested in whether or not the added cost and trouble of the proposed system would be justified by the benefits the system would give.

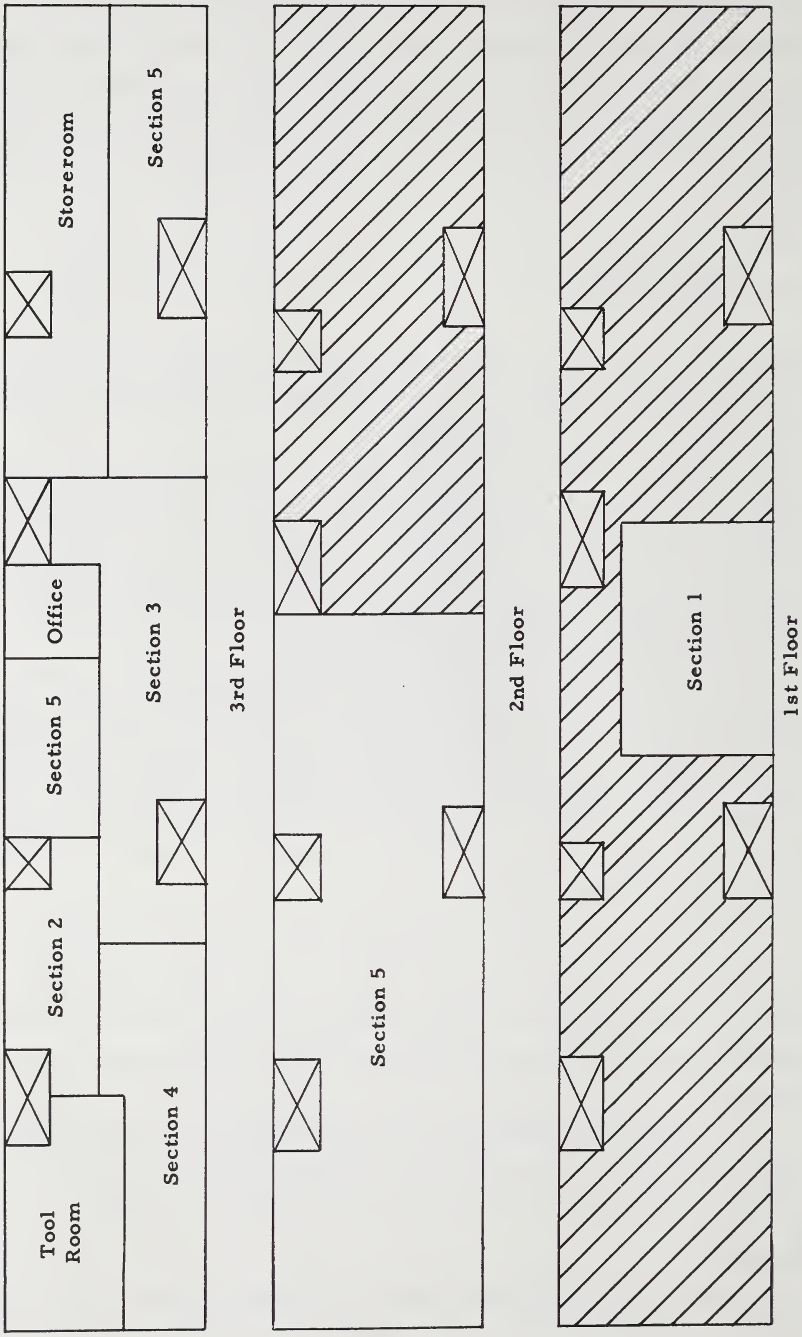
Questions

1. What are the differences in the cost of Valve 301 under the proposed method as compared with the present method? In value of spare parts added to

Exhibit 1

LAREN MANUFACTURING COMPANY

Floor Area Occupied by Valve Department


Storeroom
Section 5
Office
Section 3
Section 5
Section 2
Section 4
Tool Room
3rd Floor
Section 5
2nd Floor
Section 1
1st Floor

inventory each month? In the cost of work done for other departments? Are these cost differences significant?

2. What causes the difference in costs given by the proposed method as compared with the present method?

3. Suppose that the company purchased a $50,000 machine which would cut in half the machining time required for special valves produced in Section 4. As a result, the labor time to machine the valves is cut in half, and the extra workers are transferred to another department. Twenty per cent of the burden in Section 4 is variable with respect to machining time. During August, 1953, only special valves were worked on in Section 4:

a) Calculate what the total cost per hour would be after the new machine is in operation if there were but one cost center for the whole department. Assume that otherwise the situation is the same as the actual situation in 1953.

b) Calculate what the total cost per hour would be if Section 4 were a separate cost center.

c) What would happen to the computed costs per month of producing special valves with a single cost center, after purchase of the machine, as compared with the cost before purchase of the machine?

d) What would happen to the computed costs per month of producing special valves with five cost centers, after purchase of the new machine, as compared with the cost before purchase of the machine?

e) What do you conclude about the relative usefulness of the two methods (single cost center vs. five cost centers)?

4. What management benefits, if any, would you expect from the proposed system, i.e., the allocation and collection of costs by sections? Consider this question from the standpoint of (*a*) product pricing, (*b*) cost control, (*c*) inventory valuation, and (*d*) charges to other departments. Do you think these benefits would outweigh the costs of collection of the necessary data?

Exhibit 2

LAREN MANUFACTURING COMPANY

Functions Performed in Valve Department

Section 1 Welding	This section repairs casting defects, welds special fittings to valve bodies, and performs other welding operations required in fabrication of valve parts.
Section 2 Grinding	Grinding is done to prepare castings for further machining. Also, various parts which make up valves are ground for precision fit.
Section 3 Machining	All the necessary machining operations to produce various standard valves are done in this section.
Section 4 Special Work	Here, the layout, drilling, tapping, and special machining needed on valves other than the standard line are done.
Section 5 Assembly	This section is responsible for the assembly and testing of all valves produced in the department.

Exhibit 3

LAREN MANUFACTURING COMPANY

Production Flow through Valve Department

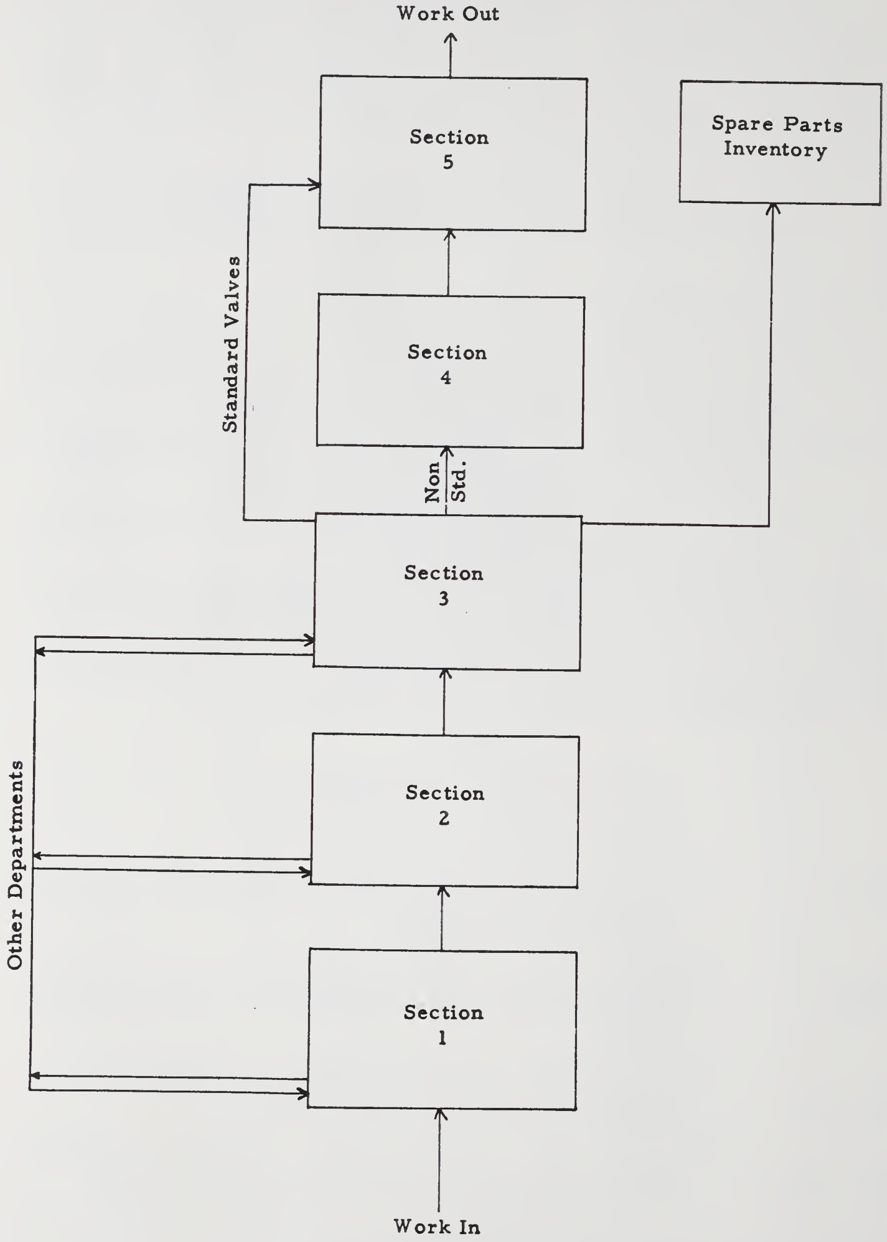

Work Out
Section 5
Spare Parts Inventory
Standard Valves
Section 4
Non Std.
Section 3
Section 2
Other Departments
Section 1
Work In

Exhibit 4

LAREN MANUFACTURING COMPANY

Calculation of Manufacturing Cost per Direct Labor Hour in the Valve Department*

(August, 1953)

Section	Labor Charge per Month	Burden	Total
Section 1	$ 1,535		
Section 2	930		
Section 3	5,360		
Section 4	2,050		
Section 5	8,700		
Total	$18,575	$30,315	$48,890

Total number of hours worked: 16,970/month
Average hourly charge: $48,890 ÷ 16,970 = $2.88

* Does not include materials.

Exhibit 5

LAREN MANUFACTURING COMPANY

Proposed Cost per Direct Labor Hour for Each Section of the Valve Department* (August, 1953)

Section	Total Hours	Labor Charge per Hour	Burden Charge per Hour	Total Cost per Hour
1	1,370	$1.12	$1.66	$2.78
2	1,000	0.93	1.55	2.48
3	4,000	1.34	3.28	4.62
4	1,800	1.14	2.10	3.24
5	8,800	0.99	1.09	2.08
Total	16,970			

* Does not include materials.

Part II

MANAGEMENT USES OF ACCOUNTING INFORMATION

Chapter

11

OVER-ALL REPORTING AND ANALYSIS: THE FUNDS FLOW STATEMENT

An accounting period is bounded by two balance sheets, one at the beginning and one at the end. The income statement, together with its related retained earnings reconciliation statement, help to explain the changes that occurred during this period in one item on the balance sheet, namely, retained earnings. In this chapter, we shall describe another accounting report that helps to explain the changes that have taken place between two balance sheet dates. This statement is called the *funds flow statement* (also "statement of sources and uses of funds," "statement of source and application of funds," "statement of the derivation and disposition of the means of operation," "where got—where gone statement," "funds statement," and other similar titles). The purpose of the funds flow statement is to report the flow of funds between the various asset and equity items during an accounting period.

What Are "Funds"?

Although accounting transactions are always measured in monetary terms, they often do not actually involve an exchange of money. If money does not change hands, the most frequent substitute is some form of promise to pay money (i.e., "credit"). In modern business, there are many more purchases and sales on credit than for cash. Machinery and buildings are usually constructed with payments to be made upon completion of the work; today's labor is paid for next week, customers are permitted to pay their bills within thirty days, and so on.

Funds are the *economic values* that change hands in business transactions or that exist in the assets of a business. It is customary to limit the simple term "funds" to those values actually connected with legally enforceable rights at a certain time; that is, to the assets and equities of the firm.

The asset side of a firm's balance sheet shows, subject to the limitation of the accounting concept of value, both that the firm controls a stated total of funds and also how it has divided this total among various types of assets. As an example, the assets as shown on the December 31, 1955, balance sheet of a small retail department store are:

Cash on hand and in banks	$112,683
Accounts receivable	34,985
Inventory of merchandise	97,882
U.S. government bonds	112,400
Unexpired insurance	518
Inventory of supplies	2,024
Store property (net)	20,745
Total Assets	$381,237

This firm controls funds totaling $381,237, and they are distributed as shown in the statement. This distribution represents the accumulated effect of all transactions up to December 31, 1955. As a result of all individual transactions, management has arranged that $20,745 be *used* to supply fixed assets, $112,400 be *invested* in U.S. government bonds, $97,882 be *used* to finance inventories of merchandise, $112,683 to supply a cash balance, and so on.

The designation of a cash balance as a *use* of funds may seem to be a contradiction of terms, but it really is not. Funds represent disposable purchasing power in any form, and cash is only one of the forms that purchasing power can take. The $112,683 cash balance on the sample statement represents management's decision to *use* this amount of the total funds by keeping it in cash rather than putting it in some other asset.

In general, if a particular asset has increased in amount during a period of time, an additional quantity of funds has been *used* for this asset. Conversely, if any asset has been reduced in amount, it has provided a *source* of funds. (The foregoing statements are subject to exceptions to be discussed later.)

This concept can perhaps be made clearer by tracing a series of transactions involving the acquisition and sale of goods in a retail store. If inventory is purchased by a cash payment, cash has provided a *source* of funds, and these funds are *used* for the acquisition of goods. Cash will also provide a *source* of funds for wages and other operating expenses; that is, these funds are *used* to pay current expenses. When a sale takes place, the reduction of inventory provides a *source* which is *used* to carry the customer's account receivable (although here the two amounts are unequal, the difference being the gross profit in the transaction). The gross profit of the business is a *source* of funds, and these funds are also *used* initially to increase accounts receivable. Later, when the customer pays his bill, the reduction of the account receivable is a *source* which is *used* to increase the Cash account. This example emphasizes the point already made, that funds are economic values which are transferred in business transactions, and that cash is only one of the forms in which funds may be invested.

The foregoing discussion of the asset side of the balance sheet of a firm can be paralleled by a description of the equities side, which, for the department store, is as follows:

Liabilities:	
Accounts payable	$ 710
Federal income taxes payable	27,362
Other taxes payable	3,082
Accrued expenses	650
Total Liabilities	$ 31,804
Capital stock and retained earnings	349,433
Total Equities	$381,237

This side of the statement shows how management has supplied the business with the funds it has used in acquiring assets up to December 31, 1955.

When the store *uses* funds to increase inventories, it may find a *source* in trade credit, shown as accounts payable, or by a loan, shown as notes payable. If the store increases the cost of its goods by expending wages on the care of the goods, the increasing value of the inventory represents the *use* of funds, while the growing amount owed for wages represents the *source.* Whenever the liabilities are settled, some value is *used* to reduce the debt. Thus a cash payment to settle an account payable is a transaction in which the reduction of cash is the *source* that is *used* to pay the debt.

The foregoing explanation should serve to give more meaning to such common phrases used in business as "we must raise funds to increase our inventory," "we have funds tied up in fixed assets," "we raised funds by collecting receivables," and "we have an emergency reserve of funds invested in government bonds."

Funds Flow Statement

The funds flow statement is essentially derived from a rearrangement of the changes that have occurred in asset and equities items between two balance sheet dates, supplemented by some data from the income statement or other sources. It is *not* prepared directly from the accounts, as are the balance sheet and income statement.

The *comparative balance sheet,* an example of which is shown in

Illustration 11–1, is useful in providing the basic raw data for the preparation of the funds flow statement. In fact, in its simplest form the funds flow statement is merely a rearrangement of the figures in the "increase or decrease" column of the comparative balance sheet,

Illustration 11–1

BALDWIN MARKET COMPANY

Comparative Balance Sheet

	Dec. 31, 1954	Dec. 31, 1955	Increase or (Decrease)
ASSETS			
Current Assets:			
Cash	$ 15,189	$ 12,736	$(2,453)
Accounts receivable	55,365	122,842	67,477
Inventories	186,924	248,510	61,586
Securities	100,000	......	(100,000)
Prepaid expenses	8,177	9,155	978
Total Current Assets	$365,655	$393,243	$ 27,588
Fixed Assets:			
Land	$ 40,000	$ 40,000	$ ......
Buildings and equipment	246,229	378,002	131,773
Fixtures	87,768	100,560	12,792
Automobiles	638	3,510	2,872
	$374,635	$522,072	$147,437
Less: Accumulated depreciation	(105,057)	(28,427)	(76,630)
Total Fixed Assets (Net)	$269,578	$493,645	$224,067
Total Assets	$635,233	$886,888	$251,655
EQUITIES			
Current Liabilities:			
Accounts payable	$ 32,961	$ 76,146	$ 43,185
Bank loan payable	......	26,000	26,000
Social security taxes accrued	1,625	950	(675)
Total Current Liabilities	$ 34,586	$103,096	$ 68,510
Fixed Debt:			
Mortgage notes payable	......	$175,000	$175,000
Capital:			
Capital stock	$ 65,000	$ 65,000	$ ......
Retained earnings	535,647	543,792	8,145
Total Capital	$600,647	$608,792	$ 8,145
Total Equities	$635,233	$886,888	$251,655

made so as to provide a more meaningful presentation of the changes in the balance sheet items.

The increases and decreases in items on the balance sheets are related in two ways:

1. The net change in assets = the net change in equities (i.e., liabilities + owners' equity); and
2. Increases in assets + decreases in equities = decreases in assets + increases in equities.

The second of these relationships follows from the first.[1]

This second relationship states that changes in a company's financial make-up that are represented by increases in certain asset items or decreases in equities are matched in total by a combination of two counterbalancing changes: decreases in other asset items or increases in equities. This relationship is the basis for describing the sources and uses of funds during an accounting period. Funds are *provided* by outsiders (increases in liabilities) or owners (increases in owners' equity) or by the release of amounts previously tied up in assets (decreases in assets). Funds are

Illustration 11–2

BALDWIN MARKET COMPANY

Funds Flow Statement for the Year Ending December 31, 1955

USES OF FUNDS (Increases in Assets) (Decreases in Liabilities and Owners' Equity)		SOURCES OF FUNDS (Decreases in Assets) (Increases in Liabilities and Owners' Equity)	
Increases in Assets:		*Decreases in Assets:*	
Accounts receivable	$ 67,477	Cash	$ 2,453
Inventories	61,586	Securities	100,000
Prepaid expenses	978		$102,453
Fixed assets (net)	224,067		
	$354,108	*Increases in Liabilities:*	
Decreases in Liabilities:		Accounts payable	$ 43,185
Accrued social security taxes	675	Bank loans payable	26,000
		Mortgage payable	175,000
			$244,185
		Increase in Owners' Equity:	
		Retained earnings	8,145
	$354,783		$354,783

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[1] If a stands for the dollar amount of asset increases and a' for the asset decreases, while b stands for increases in equities and b' for decreases in equities, then we have for the first of the two relationships:

$$a - a' = b - b'$$

The second relationship is derived from the first by elementary algebra, changing the signs of a' and b' and transferring from one side of the equation to the other:

$$a + b' = b + a'$$

used to add to assets (increases in assets) or to reduce indebtedness (decreases in liabilities), to pay dividends or capital to the owners (decreases in owners' equity), or to cover losses (also a decrease in owners' equity).

A simple summary of these changes for the Baldwin Market Company, using the data given in Illustration 11–1, is shown in Illustration 11–2. The same information is presented in narrative form in Illustration 11–3.

Illustration 11–3

BALDWIN CO-OPERATIVE MARKET

Report to Directors Showing Results of Merchandising and Expansion of Operations, 1955

During the past year your management has concentrated on expanding Baldwin's physical facilities (buildings, equipment, fixtures, and automobiles) and its inventory in order to be in a better position to serve an increasing number of customers.

This policy resulted in an increase in our assets as follows:

(Uses of funds)

Current Asset Increases:		
Accounts receivable	$ 67,477	
Inventories	61,586	
Prepaid expenses	978	
Fixed Asset Increases (Net):		
New buildings, fixtures, and automobiles	224,067	

and a decrease in one item of liability:

Liability Decreases:		
Accrued social security taxes	675	
		$354,783

These new assets were obtained in part through the normal operation of the business, in part by use of cash on hand, dealings with suppliers, and retention of profits from operations, and in part by a bank loan and the sale of some securities accumulated for this purpose.

(Sources of funds)

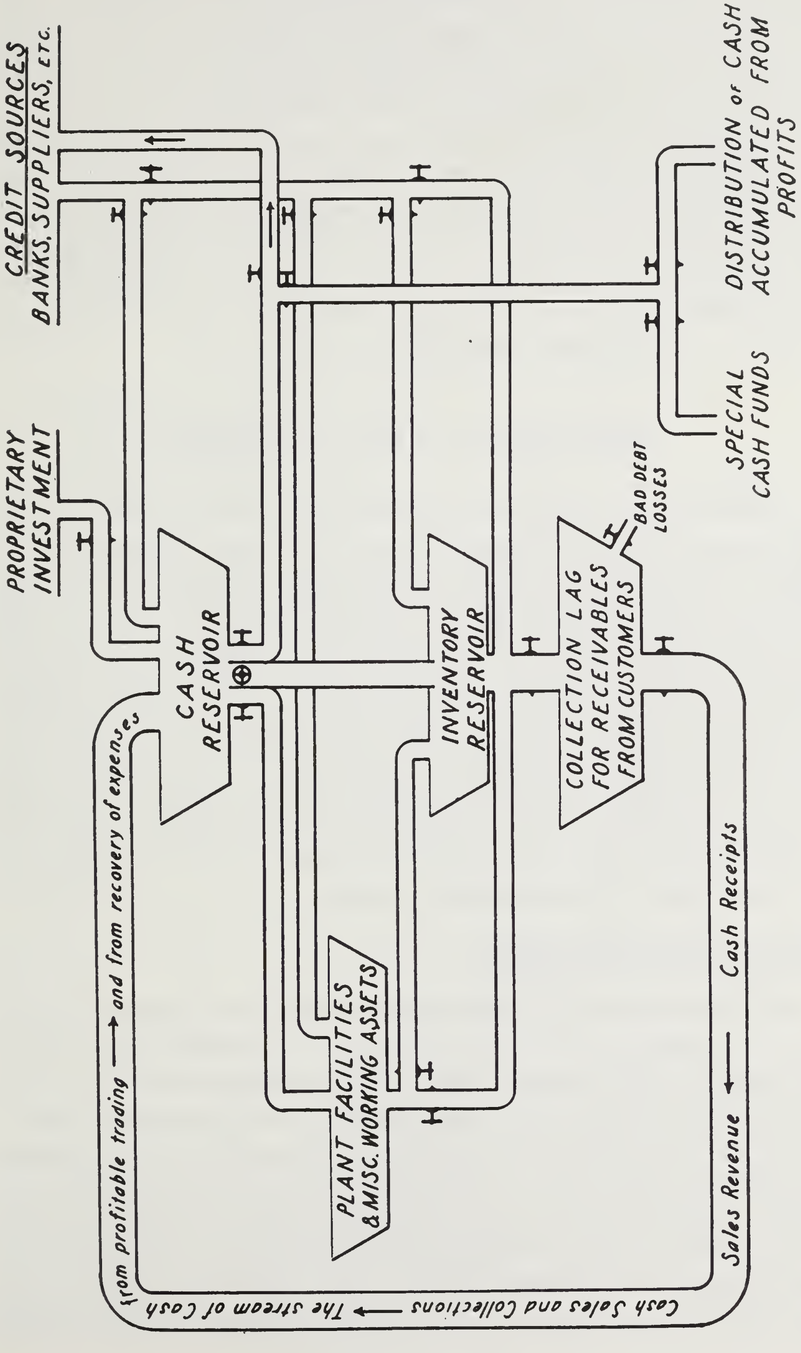
Current Asset Decreases:		
Cash	$ 2,453	
Securities	100,000	
Current Liability Increases:		
Bank loan payable	26,000	
Accounts payable	43,185	
Retention of Profits	8,145	

Additional funds were needed, however, and these were obtained by borrowing as follows:

Fixed Debt Increases:		
Mortgage notes payable	175,000	
		$354,783

Illustration 11–4

DIAGRAMMATIC REPRESENTATION OF FLOW OF FUNDS


CREDIT SOURCES
BANKS, SUPPLIERS, ETC.
PROPRIETARY INVESTMENT
DISTRIBUTION of CASH ACCUMULATED FROM PROFITS
SPECIAL CASH FUNDS
BAD DEBT LOSSES
CASH RESERVOIR
INVENTORY RESERVOIR
COLLECTION LAG FOR RECEIVABLES FROM CUSTOMERS
PLANT FACILITIES & MISC. WORKING ASSETS
Cash Sales and Collections ← The stream of Cash from profitable trading → and from recovery of expenses
Sales Revenue ← Cash Receipts

A diagram of the "circulation" or "flow" of funds through a business is shown in Illustration 11–4. This diagram illustrates the continuous, circular movement of funds through various accounts in a business as goods are purchased, sales are made, creditors are paid, customers pay their bills, and so on. The net effect of all these actions is summed up in the balance sheet figures for the various accounts involved, but it must be remembered that the process itself is continuous, and that the balance sheet shows the status of these accounts only as of a given moment of time. Thus, the analysis of changes in the items on two successive balance sheets does not reveal *all* the movements that have occurred within the accounting period. For this reason additional information is often added to the funds flow statement to make the description of the flow of funds more complete.

REFINEMENTS IN THE STATEMENTS

There is no prescribed format for the funds flow statement; the only requirement is that of maximum clarity and utility. Oftentimes, it is possible to go behind the figures representing changes in the balance sheet items (such as those shown in Illustration 11–1) and find other information that increases the usefulness of the report. Some of this information is found in the income statement and retained earnings reconciliation statement; other useful information may be found in the annual report of the company; still other data can be obtained only from the underlying accounting records. Of the various refinements that can be made to make the statement more complete, two will be mentioned here: (1) an analysis of changes in owners' equity, and (2) an analysis of changes in fixed assets.

Changes in Owners' Equity

On Illustration 11–2 the increase of $8,145 in owners' equity is shown as a source of funds. Examination of the income statement and the related retained earnings reconciliation statement for 1955 (Illustration 11–5), reveals that this increase is (except for the item of $9,219, which is discussed below) the net result of two somewhat counteracting influences: (1) the earning of income, which *increased* owners' equity by $95,679; and (2) the payment of dividends, which *decreased* owners' equity by $78,315. Reporting these two amounts as separate items on the funds flow statement would show more clearly what has happened than the mere statement of the net result. Net income is a *source* of funds, and the payment of dividends is a *use* of funds.

Illustration 11–5

BALDWIN MARKET COMPANY

Condensed Income Statement for 1955

Net sales	$765,753
Cost of goods sold	547,707
Gross profit	$218,046
Expenses (including depreciation expense of $22,575)	157,115
Net operating profit	$ 60,931
Other income	34,748
Net Income	$ 95,679

Retained Earnings Reconciliation Statement

Retained earnings as of December 31, 1954		$535,647
Add net income for 1955	$95,679	
Subtract dividends paid	78,315	
Subtract loss on sale of fixed assets	9,219	8,145
Retained Earnings as of December 31, 1955		$543,792

Let us look more closely at the net income figure, $95,679. This figure also shows the net effect of two opposing movements of funds: a flow *into* the business from sales and other income, and an *outward* flow represented by the expenses. One of the expense items, however, does not represent any movement of funds during the current accounting period. This is depreciation expense, $22,575, which is an accounting write-off of part of the cost of fixed assets, most of which were probably acquired in prior periods. Funds were used at the time these assets were acquired, but the annual depreciation charge does *not* represent a use of funds.

The net income figure, $95,679, is therefore an understatement of the amount of funds flowing into the business as a result of current operations. A closer approximation of the amount of funds generated by operations is *net income plus depreciation,* or in this case $95,679 + $22,575 = $118,254.

The same reasoning could be extended to any of the other expense items because there is ordinarily no exact correspondence between the incurrence of expenses and the making of expenditures, and it is the latter which represents a flow of funds. The statement is usually more informative, however, if the net income figure is corrected only by the adding back of depreciation as described above. Other differences between expenses and expenditures will then show up as changes in the related asset and liability items.

Incidentally, the statement is sometimes made that depreciation is a source of funds. This statement is correct only figuratively, and not in a precise and literal sense. Depreciation is literally *neither* a source nor a use of funds; it does not involve a flow of funds at all. We can obtain an approximation of the funds flowing in through operations by adding back the depreciation figure to net income, but we do this in order to find the difference between revenue and the expenses other than depreciation; it is this *difference* that measures the amount of funds flowing into the business through operations.

If depreciation is added back to net income, then a corresponding change must be made in the fixed asset section of the statement in order to maintain equality. This change is described below.

Changes in Fixed Assets

In Illustration 11–2 or 11–3 the single item "Fixed Asset Increases (Net) $224,067," shows the net effect of all the changes that have affected the fixed asset accounts during the year. The funds flow statement would be more meaningful if this increase in net fixed assets were broken down into its various components so that the statement revealed the nature of the separate changes which together produced this increase of $224,067.

For reasons given above, depreciation expense of $22,575 was added back to net income. The same amount, $22,575, should also be added to the fixed asset item since this amount, recorded as the accumulated depreciation for the year, does not represent a flow of funds.

Similarly, the $9,219 write-off of fixed assets reported on the retained earnings reconciliation statement, (Illustration 11–5) does not represent a use of funds since it is a bookkeeping entry which signifies that assets were disposed of for $9,219 less than their net book value. The $9,219 is a decrease in owners' equity but does not represent an actual use of funds. This fact will be taken into account in the analysis described below.

Other changes in the fixed assets accounts arose because of (1) the sale or other disposition of assets, and (2) the acquisition of new fixed assets. In a roundabout way, the magnitude of these changes can be deduced even though the figures do not appear in the statements. The reasoning required to make this deduction is as follows:

Since the 1955 depreciation expense was $22,575, it would be expected that unless other changes occurred in the Accumulated Depreciation account, this account would have increased by $22,575. Illustration 11–1, however, shows that the Accumulated Depreciation account actually *decreased* $76,630. The only other event that could affect the account is a sale or other disposition of fixed assets on which depreciation has been accumulated. The amount of accumulated depreciation written off in 1955 must have been, therefore, $76,630 *plus* $22,575, or $99,205. This indicates that property for which accumulated depreciation of $99,205 had been built up was written off during the year. Apparently, this property has a book value of at least $9,219 more than this, since the $9,219 write-off item on the retained earnings reconciliation statement previously mentioned means that assets with a cost of at least $9,219 more than the depreciation accumulated for them were disposed of. Thus, the gross book value of fixed assets (before depreciation) was reduced by at least $99,205 plus $9,219, or $108,424, during 1955; it was then built up by additions of fixed assets to give the net increase of $147,437 shown in Illustration 11–1. It can be estimated, therefore, that the new assets must have cost $108,424 plus $147,437, or $255,861.

It is possible, however, that new assets acquired in 1955 cost more than $255,861. The reason is that the write-off of old assets might in fact have been larger than the $108,424 already estimated. Had the write-off been larger, the additions would have to be correspondingly larger to give the same net increase in fixed assets of $147,437. The write-off of old assets could have been larger than the estimated $108,424, without this fact being indicated in the statements, if assets were sold for cash. Since there is no way of extracting such cash transactions from the myriad of other cash transactions without an inspection of the accounting records themselves, it is impossible to know, from the information available to us, the cash proceeds obtained from the sale of fixed assets. Thus, the assets written off might have been greater, by the amount of cash proceeds from their sale, than the write-off of depreciation plus the loss sustained on some of the assets. Without examining the accounting records or obtaining additional information, the closest estimates of write-offs and new acquisitions that can be made is that they were *at least* $108,824 and $255,861, respectively.

The additional information on fixed assets that has been extracted from the statements by the above reasoning process is valuable for the greater detail and meaning it gives to an analysis of the flow of funds. It should be pointed out that when the funds flow statement is prepared by someone within a company, such a roundabout analysis of fixed asset changes is unnecessary since the exact figures are available in the company records. When the report is being prepared solely on the basis of published information, however, this approach is often the only one possible. Thus it is often used by investment analysts and by companies studying the activities of their competitors.

Variations in Presentation

The funds flow statement shown in Illustration 11–6 includes the refinements in funds analysis described above. These refinements are not the only ones that may be useful. Any significant figure that reflects an accounting entry not involving the flow of funds is ordinarily adjusted in the same way as depreciation was handled above. For example, the write-off of bond discount is an expense that does not involve the use of funds. Therefore, this amount, if it is significant, may be added back to net income along with the annual depreciation charge to give the total funds flowing into the business through operations.

Illustration 11–6

BALDWIN MARKET COMPANY

Funds Flow Statement for the Year Ending December 31, 1955

WHAT WE DID		HOW WE FINANCED IT		
Expanded:		Reduced cash		$ 2,453
		Sold security holdings		100,000
Accounts receivable	$ 67,477			
Inventories	61,586	Borrowed:		
		Accounts payable		43,185
Acquired new fixed assets	255,861	Bank loan		26,000
		Mortgage		175,000
Paid dividends	78,315			
		Obtained funds from operations		118,254
Miscellaneous changes*	1,653	*a*) Net income	$95,679	
		b) Allowance for depreciation	22,575	
	$464,892			$464,892

* These consist of the $978 increase in prepaid expenses and the $675 decrease in Social Security Taxes Accrued, which were considered too insignificant to be listed as separate items.

It should again be emphasized that the statements shown in Illustrations 11–2, 11–3, and 11–6 are illustrative of reports useful in one situation and are not intended as formats to be copied for use in different situations. In fact, the format and terminology of these exhibits has been deliberately varied in order to emphasize the fact that there is no standard terminology or format.

One common variation is illustrated by the funds flow statement of United States Steel Corporation (Illustration 11–7). This statement focuses on changes in the more permanent assets and equities, with the net effect of these changes on working capital (here, a reduction of $56,871,897) being shown as a single item. Often when this format is used, it will be accompanied by a separate statement, called "Analysis of working capital changes," showing changes in the individual current asset and current liability items that together make up net working capital.

Illustration 11–7

U.S. STEEL CORPORATION

Summary of 1955 Financial Operations

Additions to working capital:		
Income		$370,099,353
Add: Wear and exhaustion of facilities		285,199,386
Proceeds from sales and salvage of plant and equipment		6,724,752
Proceeds from sale of common stock under Stock Option Incentive Plan		13,759,475
Miscellaneous additions		94,448
Total Additions		$675,877,414
Deductions from working capital:		
Expended for plant and equipment	$239,828,755	
Set aside for property additions and replacements	300,000,000	
Reduction in total long-term debt	44,793,446	
Dividends declared on preferred and common stocks	148,127,110	
Total Deductions		732,749,311
Reduction in Working Capital		$ 56,871,897
Working capital per consolidated statement of financial position:		
December 31, 1955	$695,141,324	
December 31, 1954	752,013,221	
Reduction		$ 56,871,897

Source: 1955 Annual Report.

Another variation is to report more detail about the flow of funds resulting from operations. Thus, rather than summarizing the results of operations as a single figure, the funds flowing in from sales (cash sales plus collections on receivables) and the funds flowing out in the form of outlays for costs and expenses might be reported separately.

Summary

A set of steps that can be followed in preparing many funds flow statements is as follows:

1. Start with a list of the changes between the beginning and ending amounts for each item shown on the two balance sheets that bound the period being analyzed. As a first approximation of the funds flow, list increases in assets and decreases in equities as uses of funds, and decreases in assets and increases in equities as sources of funds.

2. From the income statement, retained earnings reconciliation statement, text of the annual report, or (if accessible) the accounts themselves, collect other significant information about the flow of

funds during the accounting period. This may include such items as dividends declared or paid, cost of new fixed assets acquired, proceeds from fixed assets sold, and significant accounting entries, such as depreciation expense, that did not represent a flow of funds. If necessary and feasible, deduce some of these items by the process described on pages 208–212.

3. Adjust the balance sheet changes to take account of the new information, being careful to make offsetting adjustments so as to maintain debit and credit equality. One possible pattern of adjustments is:

a) Set up a new item, "funds provided by operations," equal to the sum of net income plus depreciation expense. Adjust the owner's equity and fixed asset items by the amount of net income and depreciation, respectively.

b) Set up a new item, "dividends," and make a corresponding change in the owner's equity item.

c) If the adjustments in (*a*) and (*b*) do not entirely account for the change in owner's equity, make additional adjustments necessary to account for this change, using information in the retained earnings reconciliation statement. If, for example, there is a loss or gain on the sale of fixed assets, reverse the accounting entry that recorded the loss. If additional stock was sold, show this as a separate item.

d) If information is available, set up an item, "proceeds from the sale of fixed assets," with an offsetting adjustment to the fixed asset item. The total proceeds from the sale should be shown as one item; that is, there should not be one item for that part of the proceeds which represents book value and another item for that part which represents a gain or loss.

e) At this point, the residual fixed asset change should represent the cost of new assets acquired and can be so designated.

f) To the extent that information is available about other significant changes that are buried in balance sheet items, show these separately, and make corresponding adjustments in the items in which they were originally included. For example, the list of balance sheet items will show only the net change in liability arising from a bond refunding operation, but it may be desirable to show separately the two parts of the operation: the funds provided by the new bond issue and the funds used to retire the old issue.

g) To the extent that information is available about other significant accounting entries that did not involve a flow of funds, reverse these entries; i.e., debit the account that originally was credited and credit the account that originally was debited. Examples of such entries are: the creation of a reserve for contingencies, the amortization or write-off of a significant intangible asset, recording a donated asset at its estimated market value, or recording or amortizing discount or premium on the sale of bonds.

4. The foregoing process provides the raw material for the funds flow statement, and the remaining task is to prepare the statement so that it is informative and focuses attention on important changes. This is done by combining minor items, by rearrangement, and by the use of clear captions and explanatory statements.

Often the use of a work sheet facilitates the mechanical part of the process of preparing the funds flow statement. The format of such a work sheet is almost self-evident from the foregoing description. Balance sheet changes are listed in the first pair of columns, with increases in assets and decreases in equities in the debit column, and the remaining items in the credit column. Adjustments, as listed in No. 3 above, are entered in a second pair of columns. The adjusted changes, from which the statement is prepared, are obtained by horizontal addition or subtraction and entered in a final pair of columns, with the debit column being headed "uses" and the credit column, "sources."

CASES

CASE 11–1. MARRETT MANUFACTURING COMPANY (C)

Refer to the situation described in Marrett Manufacturing Company (A) (page 135). Prepare an estimated funds flow statement for the year 1956.

CASE 11–2. GRETLIN CORPORATION

Balance sheets as of December 31, 1954, and December 31, 1955, for the Gretlin Corporation are shown in Exhibit 1 (page 216).

Sales for the year 1955 were $210,000. Net profit after taxes was $7,000. In arriving at net profit, items deducted from sales included, among others: cost of goods sold, $165,000; depreciation, $5,000; wages and salaries, $20,000; and a loss of $1,000 on the sale of a truck. The truck had cost $6,000, depreciation of $2,000 had been accumulated for it, and it was sold for $3,000. This was the only asset written off during the year. The company declared and paid $6,000 in dividends during the year.

Exhibit 1

GRETLIN CORPORATION

Comparative Balance Sheets

	Dec. 31, 1954		Dec. 31, 1955		Increase or (Decrease)
ASSETS					
Cash		$ 5,000		$ 6,000	$ 1,000
Accounts receivable (net)		14,000		14,000	
Inventory		22,000		8,000	(14,000)
Prepaid insurance		200		250	50
Prepaid rent		150		100	(50)
Prepaid property taxes		300		400	100
Land		4,000		8,000	4,000
Building and equipment	$30,000		$50,000		
Less: Accumulated depreciation	10,000	20,000	13,000	37,000	17,000
Total		$65,650		$73,750	$ 8,100
EQUITIES					
Accounts payable		$20,000		$18,000	$(2,000)
Accrued expenses		2,000		4,000	2,000
Accrued income tax		1,000		3,100	2,100
Capital stock		30,000		35,000	5,000
Retained earnings		12,650		13,650	1,000
Total		$65,650		$73,750	$ 8,100

Questions

1. Prepare a funds flow statement for the Gretlin Corporation covering the year ending December 31, 1955.
2. Describe the most significant development revealed by this statement.

CASE 11–3. CONLEY INSTRUMENT COMPANY

Balance sheets for the Conley Instrument Company as of December 31, 1952, and December 31, 1953, are shown in Exhibit 1, and a Statement of Income and Reconciliation of Retained Earnings for 1953 appears in Exhibit 2. Among the assets sold in 1953 was a machine, which was sold for $2,000 cash. This machine had cost $12,000, and depreciation of $10,000 had been accumulated on it. A delivery truck on which no depreciation had been accumulated was also sold during the year.

Questions

1. Prepare a funds flow statement.
2. Explain the significant happenings which this statement reveals.

Exhibit 1

CONLEY INSTRUMENT COMPANY

Comparative Balance Sheets
December 31, 1952, and December 31, 1953

	December 31		Increase or Decrease*
	1952	1953	
ASSETS			
Current Assets:			
Cash	$ 17,000	$ 13,000	$ 4,000*
Accounts receivable	61,000	59,000	2,000*
Inventories	206,000	239,000	33,000
Prepaid expenses	9,000	8,000	1,000*
Total Current Assets	$293,000	$319,000	$26,000
Fixed Assets:			
Land	$ 45,000	$ 45,000	$ .....
Buildings	158,000	158,000	.....
Machinery	113,000	181,000	68,000
Delivery equipment	8,000	5,000	3,000*
Office equipment	95,000	101,000	6,000
	$419,000	$490,000	$71,000
Less: Accumulated depreciation	132,000	148,000	16,000
Total Fixed Assets (Net)	$287,000	$342,000	$55,000
Total Assets	$580,000	$661,000	$81,000
LIABILITIES AND CAPITAL			
Current Liabilities:			
Accounts payable	$ 36,000	$ 51,000	$15,000
Notes payable	32,000	27,000	5,000*
Estimated tax liability	90,000	90,000	.....
Social security taxes accrued	1,000	2,000	1,000
Total Current Liabilities	$159,000	$170,000	$11,000
Fixed Liabilities:			
Bonds payable	$200,000	$180,000	$20,000*
Capital:			
Capital stock	$100,000	$100,000	$ .....
Retained earnings	121,000	211,000	90,000
Total Capital	$221,000	$311,000	$90,000
Total Liabilities and Capital	$580,000	$661,000	$81,000

Exhibit 2

CONLEY INSTRUMENT COMPANY

Statement of Income and Reconciliation of Retained Earnings
For the Year Ended December 31, 1953

Net sales	$933,000
Less: Cost of goods sold	599,000
Gross profit	$334,000
Less: Expenses (including depreciation expenses of $26,000)	176,000
Net profit from operations	$158,000
Add: Other revenue	29,000
Income before taxes	$187,000
Provision for taxes	90,000
Net income	$ 97,000
Add: Retained earnings, December 31, 1952	121,000
	$218,000
Less: Dividends paid	7,000
Retained Earnings, December 31, 1953	$211,000

CASE 11–4. BLAINE CORPORATION

The Blaine Corporation, a medium-size industrial firm, was considering an expansion of its plant and manufacturing facilities in order to keep abreast of growth in the industry. In formulating future plans the financial analyst of the Blaine Corporation, Mr. Sloan, made an analysis of the Chapman Corporation, a strong competitor, which had recently engaged in a large expansion program. This expansion program involved not only the addition of new plant and manufacturing and transportation facilities but also the disposal of old worn-out equipment and buildings.

As part of his research, Mr. Sloan planned to make a detailed analysis of the Chapman Corporation's expansion program, the way in which it was financed, and the consequent effect on the assets and liabilities and capital structure. He planned to draw up a funds flow statement as an aid in making this analysis.

Exhibit 1 presents a comparative balance sheet for the years 1951–52; Exhibit 2, the income statement for 1952; and Exhibit 3, the statement of reconciliation of retained earnings for 1952. These exhibits were condensed slightly from financial statements published in the annual report of the Chapman Corporation.

An analysis of the increases and decreases in asset and liability accounts as indicated on the comparative balance sheet gave some insight into the magnitude of expansion, how funds were provided, and to what use they were applied. The income statement and reconciliation of re-

Exhibit 1

CHAPMAN CORPORATION

Comparative Balance Sheet, December 31, 1951, and 1952
(000 Omitted)

	Dec. 31, 1952	Dec. 31, 1951	Increase or (Decrease)
ASSETS			
Current Assets:			
Cash	$ 2,149	$ 2,334	$ (185)
Receivables, less estimated bad debts	2,637	2,528	109
U.S. government securities, at cost	1,064	3,267	(2,203)
Inventories	4,247	3,998	249
Prepaid expenses	781	748	33
Total	$10,878	$12,875	($1,997)
Investments:			
Miscellaneous investments	$ 210	$ 197	$ 13
U.S. government securities set aside, at cost:			
For property additions and replacements	200	2,500	(2,300)
For expenditures arising out of war	80	120	(40)
Total	$ 490	$ 2,817	($2,327)
Fixed Assets:			
Land	$ 774	$ 777	$ (3)
Plant and manufacturing properties	$32,535	$28,811	$3,724
Less: Accumulated depreciation	18,242	17,024	1,218
Net	$14,293	$11,787	$2,506
Transportation properties	$ 5,838	$ 5,429	$ 409
Less: Accumulated depreciation	2,389	2,280	109
Net	$ 3,449	$ 3,149	$ 300
Total	$18,516	$15,713	$2,803
Total Assets	$29,884	$31,405	($1,521)
LIABILITIES AND CAPITAL			
Current Liabilities:			
Accounts payable	$ 3,753	$ 3,397	$ 356
Unpaid taxes	2,750	5,097	(2,347)
Dividends payable	259	259	....
Long-term debt due within one year	31	24	7
Total	$ 6,793	$ 8,777	($1,984)
Fixed Liabilities:			
Long-term debt	$ 610	$ 549	$ 61
Capital:			
Preferred stock—7% cumulative, par value $100	$ 3,603	$ 3,603	$....
Common stock—stated capital $33⅓ per share	8,703	8,703	....
Retained earnings	10,175	9,773	402
Total	$22,481	$22,079	$ 402
Total Liabilities and Capital	$29,884	$31,405	($1,521)

Exhibit 2

CHAPMAN CORPORATION

Income Statement for the Year Ended December 31, 1952
(000 Omitted)

Sales		$31,373
Less: Cost of sales*		22,891
Gross profit		$ 8,482
Less: Expenses:		
Selling, general, and administrative expenses*	$5,220	
Interest	19	
State, local, and miscellaneous taxes	682	5,921
Net operating profit before income taxes		$ 2,561
Add profit from sale of fixed assets		46
Net income before income taxes		$ 2,607
Less: Estimated federal income taxes		1,170
Net Income		$ 1,437

* Includes depreciation expense for the year totaling $1,815,000.

Exhibit 3

CHAPMAN CORPORATION

Reconciliation of Retained Earnings
for the Year Ended December 31, 1952
(000 Omitted)

Retained earnings, January 1, 1952		$ 9,773
Add: Net income for year		1,437
Total		$11,210
Deduct: Dividends:		
Preferred ($7 per share)	$252	
Common ($3 per share)	783	
		1,035
Retained Earnings, December 31, 1952		$10,175

tained earnings provided additional information with respect to sources and applications of funds.

Mr. Sloan obtained certain other information from the description of the year's operations in the Chapman Corporation's annual report. He learned from this source that assets with the gross book values (i.e., before deduction for depreciation) shown below were disposed of during 1952:

Land	$ 12,000
Plant and manufacturing properties	462,000
Transportation properties	88,000

Depreciation on these assets had been accumulated in the following amounts:

Plant and manufacturing properties	$410,000
Transportation properties	78,000

The land was sold for its book value of $12,000. The sale and salvage of the other fixed assets resulted in additional proceeds of $108,000; this was $46,000 more than their book value.

Fixed assets totaling $4,692,000 were acquired during the year, but the report did not state how this total was broken down among the three categories of fixed assets.

Questions

1. Prepare a statement, such as Mr. Sloan would prepare upon completion of his computations, which lists: (*a*) all the sources of funds for the Chapman Corporation during the year, and (*b*) all the applications of these funds both as a result of normal manufacturing operations and any other transactions the company made.

2. What conclusions can you draw regarding the method of financing the expansion program?

C Turnover × Margin R.O.I.

$\frac{\text{Sales}}{\$ \text{ Capital}} \times \frac{\text{Profit}}{\text{Sales}}$

Chapter

12

OVER-ALL REPORTING AND ANALYSIS: RATIOS AND PERCENTAGES

The absolute statement that "John ran a mile in ten minutes" tells us very little about John's ability as a runner. If, however, we are also told that John is a healthy nine-year old boy, and if we can find some information on how fast other healthy nine-year-old boys can run a mile, we can make a good judgment as to how well John can run. Thus, an absolute statement is, by itself, of little use for analytical purposes, but it can become useful when related to some comparable situation.

Similarly, the statement that the cash balance in a business is $50,000 means little by itself, but it can become meaningful when related or compared to other figures. For example, the financial position of a business that has $50,000 cash and no current liabilities is considerably different from the financial position of another business that has $50,000 cash and $60,000 of liabilities coming due in the near future.

In this chapter, some of the common devices used for comparing and analyzing the figures on balance sheets and income statements will be described.

RATIOS

A ratio is simply one number expressed in terms of another. It is found by dividing the base figure into the other. There are dozens of ratios that conceivably can be computed from a single set of financial statements, but only a few are usually helpful in the solution of a given problem. Thus, although a number of frequently used ratios are listed below, there is no point in attacking a problem by first computing all these ratios and then attempting to find some use for them. Rather, the procedure should be first to decide what, if any, ratios might be helpful, and then to compute these, and only these, ratios.

In general, financial ratios can be grouped loosely into three somewhat overlapping categories: (*a*) tests of liquidity; (*b*) tests of profitability; and (*c*) "market" tests, that is, tests used primarily by stockholders and bondholders. The ratios to be described are grouped into these categories, and the calculation of each ratio is illustrated by figures drawn from Illustrations 12–1 and 12–2, which show simplified balance sheet and income statement information for a hypothetical company. Unless otherwise indicated, all balance sheet figures used are those for December 31, 1955.

Illustration 12–1

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ARLEN COMPANY

Balance Sheets
(In Thousands of Dollars)

	December 31	
	1955	*1954*
ASSETS		
Current Assets:		
Cash	30	30
Accounts receivable	42	32
Less: Allowance for bad debts	2	2
Accounts receivable, net	40	30
Merchandise inventory	60	50
Prepaid expenses	10	10
Total Current Assets	140	120
Fixed Assets:		
Land	30	30
Buildings and equipment	120	120
Less: Accumulated depreciation	70	60
Net buildings and equipment	50	60
Total Fixed Assets	80	90
Other Assets:		
Goodwill and patents	10	0
Total Assets	230	210
EQUITIES		
Current Liabilities:		
Accounts payable	30	25
Accrued wages and taxes	10	10
Estimated income taxes payable	20	15
Total Current Liabilities	60	50
Fixed Liabilities:		
Mortgage bonds, 4 per cent	40	40
Total Liabilities	100	90
Capital:		
Common stock (5,000 shares outstanding)	60	60
Retained earnings	70	60
Total Capital	130	120
Total Equities	230	210

Illustration 12–2

ARLEN COMPANY

Condensed Income Statement, 1955
(In Thousands of Dollars)

	Dollars	*Percentage*
Gross sales	303	101.0
Less: Returns and allowances	3	1.0
Net sales	300	100.0
Less: Cost of sales	180	60.0
Gross profit	120	40.0
Operating expenses	78	26.0
Operating profit	42	14.0
Interest	2	.7
Income before taxes	40	13.3
Provision for income taxes	20	6.7
Net Income	20	6.7

Tests of Liquidity

1. *Current Ratio.* This is the ratio of current assets to current liabilities. For the Arlen Company, this is:

$$\frac{\text{Current assets}}{\text{Current liabilities}} = \frac{\$140{,}000}{\$60{,}000} = 2.3 \text{ times, or } 2.3 \text{ to } 1.$$

In other words, current assets are 2.3 times current liabilities.

The current ratio is the most commonly used of all balance sheet ratios. To the short-term lender it is a measure of the company's liquidity, that is, its ability to pay its current obligations. From another standpoint, it is a measure of the margin of safety that management maintains to allow for the inevitable unevenness in the flow of funds through the current asset and liability accounts. If this flow were absolutely smooth and uniform each day (so that, for example, payments received from customers exactly equaled maturing obligations), the requirements for such a safety margin would be small.

2. *Acid Test Ratio.* This is the ratio of so-called *quick assets* to current liabilities. Quick assets are cash, temporary investments held in lieu of cash, and receivables (both current notes receivable and accounts receivable). For the Arlen Company the acid test ratio is:

$$\frac{\text{Quick assets}}{\text{Current liabilities}} = \frac{\$70{,}000}{\$60{,}000} = 1.2 \text{ times, or } 1.2 \text{ to } 1.$$

The items included as quick assets are cash and assets which presumably can be converted into cash quickly and at approximately their stated amounts. The acid test ratio therefore is a measure of the extent to which liquid resources are immediately available to meet current obligations.

3. ***Average Collection Period.*** This ratio is also, and more properly, called "Days' sales on the books." It is the ratio of trade accounts receivable plus notes receivable to average daily credit sales. Usually, published income statements do not show credit sales separately from cash sales, and it is therefore necessary to use the net sales figure. In many companies, nearly all sales are made on credit, but even in those cases where cash sales are significant, a comparison of the collection periods of two companies may have validity if they both have the same *proportion* of cash sales to total sales. For the Arlen Company, average daily sales in 1955 were \$300,000/365 = \$822. In the example, the divisor is the *total* number of days in the year. The ratio is also computed on the basis of the number of *working* days, say 250. The average collection period is:

$$\frac{\text{Accounts receivable (net)}}{\text{Average daily sales}} = \frac{\$40{,}000}{\$822} = 49 \text{ days.}$$

Receivables which do not arise from regular sales (e.g., a note received from the buyer of fixed assets) should, if possible, be excluded. Sometimes the ratio is computed from the *average* of accounts receivable for the beginning and end of the year (for the Arlen Company $\frac{\$30{,}000 + \$40{,}000}{2} = \$35{,}000$), rather than from the ending balance of accounts receivable as was done in the above illustration.

The collection period can be related roughly to the credit terms offered by the company. There is a rule of thumb that the collection period should not exceed 1⅓ times the regular payment period; thus, if the company's typical terms call for payment in thirty days, it is said that the average collection period should not exceed forty days. Like all rules of thumb, this one has a great many exceptions. The ratio is more informative if it is compared with similar ratios for other companies or for prior years in the same company, for such comparisons may indicate either significant shifts in credit policy or changes in the company's ability to collect its receivables.

4. ***Receivables to Sales.*** This is another way of expressing the same relationship as expressed by the average collection period. The ratio for the Arlen Company is:

$$\frac{\text{Accounts receivable (net)}}{\text{Net sales}} = \frac{\$\ 40{,}000}{\$300{,}000} = 13.3 \text{ per cent.}$$

5. ***Inventory Turnover.*** This ratio is found by dividing cost of sales by the average inventory (average of the beginning and ending inventories). For the Arlen Company, average inventory is:

$$\frac{\$50{,}000 + \$60{,}000}{2} = \$55{,}000.$$

Inventory turnover is:

$$\frac{\text{Cost of sales}}{\text{Average inventory}} = \frac{\$180{,}000}{\$\ 55{,}000} = 3.3 \text{ times.}$$

If the cost of sales figure is not available, a turnover ratio may be computed using the sales figure instead. Such a ratio does not then show literally how many times the inventory turned over during the year, but if profit margins remain roughly constant, a comparison of this ratio for several years may nevertheless be useful.

Inventory turnover is an indication of the velocity with which merchandise moves through the business. An increase in the absolute size of inventory, for example, may represent the additional stocks required by an expanding business, or it may represent an accumulation of merchandise because sales have dropped off. In the former case, the inventory turnover will remain constant, or even increase, but in the latter case, turnover will decrease. (The student can easily check this statement by tracing through the effect of some hypothetical changes in the figures on Illustration 12–1.) A decrease in the inventory turnover ratio may therefore be a significant danger signal.

Tests of Profitability

6. ***Gross Profit Ratio.*** This is the ratio of gross profit to net sales. For the Arlen Company, it is:

$$\frac{\text{Gross profit}}{\text{Net sales}} = \frac{\$120{,}000}{\$300{,}000} = 40 \text{ per cent.}$$

This percentage indicates the average markup obtained on products sold. Since it is an average, it does not necessarily represent the markup on individual products or product lines, which may differ widely from the average figure.

6

7. ***Profit Ratio.*** The ratio of net income after taxes to net sales is widely used as a measure of the over-all profitability of operations. For the Arlen Company, it is:

$$\frac{\text{Net income}}{\text{Net sales}} = \frac{\$\ 20{,}000}{\$300{,}000} = 6.7 \text{ per cent.}$$

8. ***Return on Stockholders' Investment.*** Stockholders' investment is usually taken to mean stockholders' equity (i.e., capital) as shown by the balance sheet, or total assets less liabilities, which comes to exactly the same figure. Often, the average of the figures on the beginning and ending balance sheet is used. The average stockholders' equity for the Arlen Company is:

$$\frac{\$120{,}000 + \$130{,}000}{2} = \$125{,}000.$$

The return on stockholders' investment is:

$$\frac{\text{Net income}}{\text{Average stockholders' equity}} = \frac{\$\ 20{,}000}{\$125{,}000} = 16 \text{ per cent.}$$

A comparison of the profit ratios of two companies in different industries is usually of limited validity because margins and operating cost factors tend to differ widely among industries. The return on investment figure, on the other hand, often provides a valid basis for interindustry comparisons. Presumably investors are interested in, among other things, earning the highest possible return on their funds, and it is the relationship of net income to the funds they have invested, rather than of net income to sales, that indicates how productively their funds have been used.

A limitation on the validity of this ratio is that balance sheet asset values represent, generally, unexpired costs rather than the current market value of the assets. Two companies, for example, might have facilities that were physically identical in all respects except age, and they might operate exactly the same way and earn exactly the same profit. If, however, the buildings and equipment of one company had been purchased at a time when prices were low or if they had been almost fully depreciated, and if the buildings and equipment of the other company had been purchased at a time of higher prices or if they were relatively new, then the return-on-investment ratios of these two companies would differ considerably. The ratio for the company that carried its assets at a small book value would be much higher than the ratio for the other company.

9. ***Return on Tangible Net Worth.*** This is a variation of the return on stockholders' investment ratio. Tangible net worth is the stockholders' equity less the average book value of intangible assets. For the Arlen Company, this ratio is:

$$\frac{\text{Net income}}{\text{Avg. net worth} - \text{Avg. intangibles}} = \frac{\$20{,}000}{\$125{,}000 - \$5{,}000} = 16.7 \text{ per cent.}$$

10. ***Return on Total Investment.*** This ratio is a measure of the income earned by the total permanent funds invested in the enterprise. These permanent funds consist of stockholders' equity plus noncurrent liabilities; or the same figure may be found by subtracting current liabilities from total assets. The earnings on these funds are usually taken as net income before income taxes, plus interest on noncurrent liabilities. Sometimes an after-tax earnings figure is used. Using pretax earnings, this ratio for the Arlen Company is:

$$\frac{\text{Pretax income} + \text{Bond interest}}{\text{Capital} + \text{Fixed liabilities}} = \frac{\$\ 40{,}000 + \$\ 1{,}600}{\$125{,}000 + \$40{,}000} = 24.4 \text{ per cent.}$$

Note that the interest figure of $1,600 used in this calculation is the interest at 4 per cent on the $40,000 bonds, which is less than the total interest expense shown on the income statement. The income statement figure includes interest on current borrowings as well as bond interest.

The return on stockholders' investment ratio is a measure of how well funds supplied by the stockholders have been utilized. Similarly, the return on total investment ratio is a measure of how well management has used all the permanent funds entrusted to the business. Or, put another way, this ratio is intended to measure the earning power of the net assets (net working capital plus other assets) of the business. The limitation resulting from the fact that balance sheet assets are not valued at their real value, mentioned above, also applies to this ratio.

Market Tests

Persons who study the financial statements of companies as a basis for deciding where to invest their funds may use any of a number of other ratios in addition to those already listed. Some of these are mentioned below.

✓ 11. ***Earnings per Share.*** This ratio is obtained by dividing net income by the number of shares of common stock outstanding. If there is preferred stock, its claim to earnings (usually its dividend) is deducted from net income in order to find the amount earned on the common stock. Earnings per share is of considerable importance in estimating the value, and hence the proper market price, of a share of stock. For the Arlen Company the ratio is:

$$\frac{\text{Net income}}{\text{Shares outstanding}} = \frac{\$20{,}000}{5{,}000} = \$4.00 \text{ per share.}$$

✓ 12. ***Price-Earnings Ratio.*** This (also called the "times-earnings" ratio) is the ratio of market value of a share of stock to the earnings per share. If the Arlen Company's stock sold at an average price of $40, this ratio would be:

$$\frac{\text{Price per share}}{\text{Earnings per share}} = \frac{\$40}{\$4} = 10 \text{ to } 1.$$

There are many rules of thumb for different industries and different phases of the business cycle for the "proper" relationship between the market price of a stock and its earnings.

13. ***Yield.*** This ratio is more properly called "Dividend yield." It is the ratio obtained by dividing dividends declared per share on common stock by the market value per share. Assuming that the Arlen Company declared dividends of $2.00 per share in 1955, the ratio is:

$$\frac{\text{Dividend per share}}{\text{Price per share}} = \frac{\$2}{\$40} = 5 \text{ per cent.}$$

14. ***Times Interest Earned.*** This is the ratio:

$$\frac{\text{Pretax income} + \text{Bond interest}}{\text{Bond interest}} = \frac{\$40{,}000 + \$1{,}600}{\$1{,}600} = 26 \text{ times.}$$

This ratio is of particular interest to bondholders since it is a measure of the extent to which earnings can decline without impairing the company's ability to meet interest payment on its fixed liabilities.

15. ***Equity Ratio.*** This is stockholders' equity expressed as a percentage of stockholders' equity plus noncurrent liabilities; that is, for the Arlen Company:

$$\frac{\text{Capital}}{\text{Capital} + \text{Noncurrent liabilities}} = \frac{\$120{,}000}{\$120{,}000 + \$40{,}000} = 75 \text{ per cent.}$$

Bondholders are usually entitled to a fixed interest payment, whereas stockholders receive dividends only at the discretion of the directors. In return for the greater risk they run, stockholders usually expect a higher return than do bondholders. Thus, the greater the proportion of total investment that is derived from stockholders (either directly, or indirectly as retained earnings), the less the obligations the company has on which fixed interest payments must be met. On the other hand, the more funds that are obtained from bonds, the more the company can *trade on the equity;* that is, it can use funds obtained at relatively low interest rates in the hopes of earning more on these funds for the stockholders. The equity ratio shows the balance that the management of a particular company has struck between these forces.

COMPARISON OF RATIOS

A ratio is a single number; hence, it is practically meaningless by itself. It becomes meaningful only when it is compared with some standard. Before discussing the ways in which comparisons can be made, it may be well to list some difficulties that beset anyone who attempts to compare one ratio with another.

Difficulties in Making Comparisons

The following will each be discussed briefly;

1. Deciding on the proper standard
2. Differences in the situations being compared
3. Differences in accounting practice
4. Hidden, short-run changes
5. The past as an indication of the future

1. *Deciding on the Proper Standard.* A "standard" is a measure of what should have happened, and it is the implicit basis of comparison that a person has in mind when he says performance is "good" or "poor," "better" or "worse." Subject to only minor qualifications, a boy who runs a mile in 10 minutes (or, expressed as a ratio, 6 miles per hour) is a better distance runner than a boy who runs a mile in 11 minutes. It cannot be said with anywhere near as much confidence, however, that a current ratio of 4 to 1 is better than a current ratio of 3 to 1; that is, a high current ratio is not necessarily better than a low current ratio.

To illustrate this point, let us look back to the balance sheet in Illustration 12–1, which indicates a current ratio for the Arlen Company on December 31, 1955, of 2.3 to 1. Suppose that $40,000 of the current liabilities came due the very next day and that the company in fact paid these liabilities, using every dollar of its available cash and liquidating other current assets as well. A balance sheet prepared subsequent to this transaction would show $100,000 of current assets and $20,000 of current liabilities, and the current ratio would accordingly be 5.0 to 1, more than double the ratio of the previous day. Yet one could scarcely say that a company that had used up all its cash was in an improved financial condition. Or, conversely, consider what happens when a company expands, as illustrated by the Arlen Company balance sheet for 1955 compared with its balance sheet for 1954. Current assets have increased by $20,000 and current liabilities have increased by only $10,000, yet the current ratio has dropped from 2.4:1 to 2.3:1. The decrease may indicate no worsening of the company's liquid position at all; rather, it may reflect the results of a well carried out expansion program.

The standards applicable to some ratios are fairly clear cut. Generally, a high net profit percentage is better than a low one, and a high return on investment is better than a low one. But even these generalizations must be qualified in the light of matters mentioned below.

2. ***Differences in the Situations Being Compared.*** No reasonable person would expect a nine-year-old boy to run as fast as a nineteen-year-old athlete; in judging the boy's performance, we would attempt to compare his speed with that of other boys of the same age and with similar training. Differences in the factors that affect one company's performance this year as compared with those that affected the same company's performance last year, or the performance of another company, are complex and difficult to evaluate. Nevertheless, some attempt must be made to allow for these differences. In general, this task is least difficult when comparing a set of figures all pertaining to the same company (although even here changes in price levels, in size, in the functions performed by the company, in outside influences, and so on, may make comparisons of tenuous validity). The task is more difficult when attempting to compare one company with another, even if they are both of the same size and in the same industry, and it becomes exceedingly difficult if the two companies are in different industries or if they are of substantially different size.

3. ***Differences in Accounting Practice.*** The terms "one mile" and "ten minutes" used to measure the runner are precisely defined and easily measured, but such terms as "current assets" and "current liabilities" are by no means precisely defined, and there is considerable diversity in practice as to how they should be measured. Some of the many differences have been described in earlier chapters.

4. ***Hidden Short-Run Changes.*** A balance sheet may not reflect the average or typical situation. A balance sheet is prepared as of one moment of time, and it tells nothing about short-term fluctuations in assets and equities that have occurred between two balance sheet dates. Many department stores, for example, end their fiscal year and publish annual balance sheets as of January 31. By that date, Christmas inventories have been sold out and many of the Christmas receivables have been paid; but Easter merchandise has not started to arrive and payables for this merchandise have not yet been generated. Current assets (other than cash) and current liabilities as reported on the January 31 balance sheet are therefore likely to be lower than at other periods of the year, and as a result ratios such as merchandise turnover and the average

collection period may be distorted, and other ratios may not be representative of the situation at other seasons throughout the year. A company that is analyzing its own data can study the seasonal movements by using monthly, rather than annual, balance sheets, but these are ordinarily not available to the outsider.

The analyst should also recognize that companies have been known to take deliberate steps to "clean up" their balance sheet. They may, for example, pay off loans just before the end of the year, which inevitably increases the current ratio, and then borrow again early in the next year. Such transactions may not be discernible on the balance sheet.

5. *The Past as an Indication of the Future.* Financial statements are historical documents, and financial ratios show relationships that have existed in the past. The analyst is, of course, interested in what is happening now and what is likely to happen in the future, rather than what did happen in the past. Often the analyst has no choice but to rely on past data as an indication of the current situation, but he should not be misled into believing that the historical ratios necessarily reflect current conditions.

Possible Bases for Comparison

With the above difficulties in mind, it is possible to make some generalizations about the advantages and disadvantages of the various ways in which ratios can be studied. Their possible bases of comparison are:

1. A comparison against *budgeted* or expected performance in the company;
2. A *historical* comparison, that is a comparison of the latest ratio with corresponding ratios for previous periods in the same company;
3. A comparison with the ratios of *other companies,* presumably businesses that have a comparable environment;
4. A comparison with *published data,* either averages developed from the financial statements of a number of companies or rules of thumb which may be found in various books and articles; and
5. A comparison against standards developed through the analyst's own *experience.*

A comparison of data all drawn from a single company, either *historical* data or *budget* data, is likely to be subject to the fewest of the difficulties listed above. The company's accounting system is presumably reasonably consistent from one year to another, or if not, the changes may be known and hence taken into account. Furthermore, the analyst, if he is employed by the company, may often (but not always) recollect important factors that account for changes in the ratio. On the other hand, at its very best, a comparison between two ratios in the same company can only show that the current period is "better" or "worse" than the past, or than was expected in the budget; such a comparison can give no clue as to whether the standard being used was valid in the first place.

A *comparison between two companies* poses the problem of attempting to allow for differences between the companies. This problem has been described above. On the other hand, if the analyst has been able to allow for these differences, he obtains an outside standard to use as a check on performance, and this may be much more useful than any internal comparison.

Many sources contain *average ratios* for groups of companies in the same industry or of similar size. Perhaps the best known are those published by Dun & Bradstreet, Inc., in the magazine *Modern Industry* and in separate booklets. For each of seventy industry groups, the following ratios are published (starred items have been described above):

*Current ratio
*Net profit as a percentage of net sales
*Return on tangible net worth
Net profit as a percentage of net working capital
Net sales as a percentage of tangible net worth
Net sales as a percentage of net working capital
*Average collection period
Ratio of net sales to inventory
Ratio of fixed assets to tangible net worth
Ratio of current debt to tangible net worth
*Equity ratio
Ratio of inventory to net working capital
Ratio of current liabilities to inventory
Ratio of funded debt to net working capital

A variety of ratios will also be found in *Moody's* and other publications prepared for investors.

Use of these industry-wide ratios involves all the difficulties of using ratios derived from one other company plus the special problems that arise when the figures for several companies are thrown together into a single average. Nevertheless, they may give some worth-while impressions about the average situation in an industry.

Standards derived from *experience* are the most difficult to explain or communicate to others, but they probably provide the most valuable basis of comparison of any of those mentioned. Experience can give the analyst an understanding of the allowances that must be made when comparing one ratio with another, and a feel for what is the "right" ratio in a given set of circumstances, both of which greatly excel any mechanical formula or written rule of thumb.

PERCENTAGES

Percentages are another device useful for measuring changes and differences. A percentage is a special kind of ratio, namely, a "per hundred" rate. On Illustration 12–2, for example, the percentage of each income statement item to sales has been calculated. This is often done so as to indicate the relative importance of various income statement items.

Two of the problems that often arise when percentages are being compared will be discussed briefly: (1) the choice of a base, and (2) averaging percentages.

Choice of a Base

Suppose that sales in a company were \$1.5 million in 1955 and \$1.8 million in 1956. The change can be expressed in any one of four ways: (1) sales in 1956 were 120 per cent of sales in 1955 (1.8/1.5 [100] = 120); (2) sales in 1956 were 20 per cent higher than 1955 sales (120 — 100 = 20); (3) sales in 1955 were 83 per cent of 1956 sales (1.5/1.8 [100] = 83); and (4) sales in 1955 were 17 per cent lower than 1956 sales (83 — 100 = —17). All these statements are true; but the first two statements imply the use of the 1955 sales figure as a base while the third and fourth refer to 1956 sales as a base. So long as the particular base chosen is clearly indicated, either base may be used. When statements about the percentage choice do not clearly indicate what figure is used as the base, misunderstandings can easily be created. In order to lessen these misunderstandings, it has become conventional when comparing one time period with another to use the earlier period as the base. This practice should be followed as a matter of course, unless there is a compelling reason to make an exception to it. In the example above, then, the better choices would be "sales increased 20 per cent from 1955 to 1956," or "1956 sales were 20 per cent higher than 1955 sales."

Another convention customarily followed is the one for expressing "mark-on," which is the relationship between cost and selling price. Mark-on is ordinarily expressed as a percentage of selling price, *not* as a percentage of cost. Thus, if an article has a cost of \$0.60 and a selling price of \$1.00, its mark-on is said to be 40 per cent, not 66⅔ per cent.

Incidentally, note the following type of difficulty that may arise when the base is unconsciously shifted: Suppose the number of employees in a company is reduced 50 per cent, that subsequently it is increased 30 per cent, and still later it is increased 20 per cent. Is the number of employees now the same as at the beginning? Not if each change is figured from the base existing at the time of the change, for a quick calculation will show that the two increases have brought the labor force back to only 78 per cent of its original size. This illustrates the general point that if a number is decreased by a certain percentage, the resulting number must be increased by a larger percentage to get back to the original number. For example, if the number 10 is decreased by 40 per cent, the result, 6, must be increased by 66⅔ per cent (rather than 40 per cent) to get back to the original number, 10.

Another problem in using the correct bases arises when percentages are compared with one another. If the net profit on Product A is 2 per cent of sales and on Product B, 3 per cent, B's profit ratio is 50 per cent, *not* 1 per cent, higher than A's, since 3 is 150 per cent of 2. It is, however, a common and correct practice to describe B's profit as one *percentage point* higher than A's.

Averaging Percentages

Another problem that arises in working with percentages is illustrated by the following situation.

Suppose that the divisional income statements of a company with three divisions show the following percentages of net profit to sales:

Division	*Profit Percentage*
A	3
B	7
C	5

Can it be said that the average profit for all divisions is 5 per cent (i.e., 3 per cent + 7 per cent + 5 per cent, divided by 3)? Unless the divisions are the same size, the answer is "no." A simple average is valid only when the separate percentages have the same relative importance. If the percentages are of varying importance, either the over-all percentage must be computed from the totals for the three divisions or a *weighted average* must be used. Assume that the performance of the three divisions was:

Division	*Sales (Thousands of Dollars)*	*Profit (Thousands of Dollars)*	*Profit Percentage*
A	1,000	30	3
B	300	21	7
C	700	35	5
Total	2,000	86	

One way of finding the profit percentage of the company is to divide total profit (86) by total sales (2,000), giving an over-all profit percentage of 4.3 per cent. This procedure is simple if sales and profit data are available for the three divisions, but there are situations where the aggregates cannot be determined from the available data. In these situations, an over-all percentage may be found by taking a *weighted average* of the individual percentages. Weights may be expressed either in *absolute* terms (e.g., sales dollars) or in *relative* terms (e.g., the proportion of each plant's sales to the whole). Both methods are shown below. Although the weighting procedure is not really necessary in this case, since the answer has already been found from the aggregates, the figures illustrate the method:

	A. Absolute Weights			B. Relative Weights		
Division	Weight (Sales in Thousands of Dollars)	Profit Percentage	Weighted Percentage	Weight (Sales Relative)	Profit Percentage	Weighted Percentage
A.................	1,000	3	3,000	50	3	150
B.................	300	7	2,100	15	7	105
C.................	700	5	3,500	35	5	175
	2,000		8,600	100		430

$$\text{Average} = \frac{8{,}600}{2{,}000} = 4.3 \qquad \text{Average} = \frac{430}{100} = 4.3$$

Note that the sum of the weighted values is divided by the sum of the weights, not by the number of items being average.

SUMMARY

Under many circumstances, the figures on financial statements have meaning for analytical purposes only when they are expressed in relative terms in the form of ratios and percentages and when these relative numbers are then compared to some standard or norm. A great many ratios can be figured, but of these only a few are ordinarily necessary in connection with a given problem. Those that are relevant should be selected in advance rather than going through the mechanical process of computing all possible ratios and *then* selecting the ones that are to be used.

For many reasons, some of which have been described above, a precise comparison of one ratio with another, either from the same company, from another company, or an average of many other companies, is never possible, but an adequate allowance for factors affecting the two ratios can often be made, and this permits a comparison that has some degree of validity. The experienced person has a great advantage over the novice in making such comparisons, but the person who uses common sense, even though he lacks experience, is likely to arrive at more satisfactory conclusions than the person who relies solely on rigid formulas or rules.

Chapter

13

OVER-ALL REPORTING AND ANALYSIS: CHALLENGES TO CONVENTIONAL ACCOUNTING CONCEPTS

Up to this point, you have been asked to accept and work with generally accepted accounting concepts, whether or not you agree that these concepts are sound. This point of view has been adopted on the pragmatic grounds that most accounting reports are in fact based on these conventional concepts, and that an understanding of the concepts is therefore essential to an understanding of the report. In your analysis of certain cases, however, you may have felt a more or less vague dissatisfaction with some of the accounting conventions. This is not surprising, for others have been dissatisfied also.

Some of the attempts to evolve new concepts are described in the present chapter. They are included here partly to acquaint you with current works in the development of accounting theory, but primarily to stimulate further thinking about the meaning of accounting figures.

THE PRICE LEVEL CONTROVERSY

The most widely criticized accounting concept is the notion that "value equals cost," which means that assets are originally recorded on the books at their cost, that they are reported on balance sheets at cost (or, in the case of certain assets, at unexpired cost), and that when assets are converted into expenses, they are shown on the income statement at their cost. The advantage of this practice—certainty, ease of interpretation, and narrowing the necessity for judgment in keeping accounting records—were discussed in Chapter 3. The disadvantages become apparent during periods of changing prices, for during such periods the cost dollar, which is the monetary unit in which the accounting value of all assets is expressed, is not a stable measuring device.

Consider, for example, price levels in the two years 1940 and 1956. There is no way of stating precisely what is the difference in the price level in these two years since such a statement would have to take into account the billions of separate transactions in each year, and this is impossible. Nevertheless, a satisfactory approximation can be obtained by referring to published price indexes, which are averages of a great many prices. These indexes show that, over-all, 1940 prices were about 52 per cent of 1956 prices. This means that a dollar spent in 1956 would buy only about half the physical units of product that a 1940 dollar would buy, or, as it is often put, a 1956 dollar is a "52-cent dollar," measured in terms of its purchasing power in 1940.

Conventional accounting treats assets bought with 52-cent dollars as having the same value as assets bought with 100-cent dollars. If a company, for example, bought a 10,000-square-foot office building for $200,000 in 1940, this building would be shown on the balance sheet at $200,000, and if it bought another physically identical 10,000-square-foot building in 1956 for $400,000, this would be shown at $400,000. An unwary reader of the 1956 balance sheet might interpret the $400,000 addition as representing a tripling of office space, whereas actually it represents only the same quantity of facilities as the 1940 figure of $200,000. Or, perhaps the reader might conclude that the second building was, in 1956, *worth* double the first, which may be far from the truth.

Efforts to allow for the effect of price level changes in accounting reports fall into three major areas: (1) over-all adjustments; (2) adjustments in inventory and cost of sales; and (3) adjustments in fixed asset values and depreciation. Most of the attempts are aimed at adjusting net profit and other income statement figures, with adjustments in balance sheet figures being considered as of secondary importance. Indeed, some of the proposals (such as Lifo) yield balance sheet figures that reflect current values even less realistically than does the conventional method.

Over-All Adjustments

Studies made by the American Institute of Accountants, by the American Accounting Association, and by a few university groups and businesses have experimented with devices that will permit each item on the balance sheet and income statement to be expressed in dollars that have the same purchasing power. The objective of most of these efforts is to devise a set of financial statements that will supplement, not take the place of, the conventional balance sheet and income statement. In other words, the conventional statements would continue to be the "official" documents, and the supplementary statements would be printed elsewhere in the annual report to show the reader the impact of changes in the price level.

No attempt is made here to describe the several methods used to make these price level adjustments. Suffice it to say that at present they are in the nature of experiments, and there is no serious effort underway to restate generally accepted accounting principles so that figures adjusted to price level changes would replace, rather than supplement, the conventional figures in the accounts.

Inventory Valuation

Inventory items are owned by a company for a period of time that is relatively short compared to the time that fixed assets are owned. Nevertheless, inventory usually is an important current asset, and cost of sales—which is the counterpart of inventory—is typically the largest expense item on the income statement. Thus, although there may be only a relatively small change in price levels between the time an inventory item is purchased and the time it is sold, the impact of even a small change may be considerable on both the balance sheet and income statement figures.

Several methods for recognizing changes in the price level of inventory items have been advocated, of which the method called Lifo, or "last-in first out," is the most common. A description of Lifo is given as an appendix to the Grover Leather Company Case (p. 242).

Under the Lifo method, the cost of sales figures on the income statement tends to reflect current cost of products sold rather than the price actually paid for these products when they were purchased. On the balance sheet, inventory items tend to be valued at prices prevailing at the time the system was started, which of course may bear no relation either to the actual cost of these items or to their current market value.

Unlike the other devices discussed in this chapter, Lifo has gained acceptance as a generally accepted accounting principle; that is, companies may use either Lifo or the more conventional method, which is called Fifo. Lifo may also be used, under certain circumstances, for income tax purposes. Thus, there are now two somewhat contradictory principles for inventory valuation, either of which is acceptable. A company using Lifo ordinarily will disclose this fact in its financial statements so the reader is not left in doubt as to which method has been used in a given situation.

Fixed Assets and Depreciation

No serious effort has been made in this country to change accounting conventions so that fixed assets would be reported on the balance sheet at their current market value or replacement cost. Except in very unusual circumstances, the gross book value of fixed assets is their actual cost at the time they were acquired.

There have been attempts, however, to modify the depreciation expense figure on the income statement so that it will reflect current price levels rather than price levels existing at the time of acquisition. The most dramatic recent effort in this direction is that made by U.S. Steel Corporation in the late 1940's. The story is told in the United States Steel Corporation Case (p. 251). It should be noted that U.S. Steel's effort did not succeed, and that "depreciation based on replacement cost" is still not a generally accepted accounting principle.

In countries where postwar price inflation has been more serious than in the United States, balance sheet values based on original cost became practically meaningless. Accordingly, accountants in several such countries have devised means of reporting fixed asset values and depreciation expense in terms of current values, but these changes are outside the scope of this book.

Direct Costing

Another accounting convention that has been challenged in recent years is the convention that the inventory values and the cost of sales of a manufactured product should consist of the material, labor, and overhead cost of the product. Proponents of the system called "direct costing" argue that all, or at least some, of the overhead cost component should not be a part of inventory cost and cost of sales but rather that overhead costs should be treated as costs of the period in which they are incurred. This proposal is examined in the Beale Company Case (page 261).

The question of whether direct costing conforms to generally accepted accounting principles is not entirely clear-cut. The American Institute of Accountants Committee on Accounting Procedure specifically frowns on the practice of omitting "all" overhead costs from inventory, but it is somewhat equivocal on how much overhead has to be included in order to make the practice acceptable.

CASES

CASE 13–1. GROVER LEATHER COMPANY

In the spring of 1940 officials of the Grover Leather Company carefully considered a suggestion that the company adopt the last-in, first-out (Lifo) method of inventory valuation (see Appendix for a description of this method). As an indication of the possible impact of the Lifo method on the company's reported earnings for the years 1937, 1938, and 1939, these earnings were recalculated to give effect to the proposed method. In June, 1940, it was decided, however, that the company would not adopt the Lifo method.

The Grover Leather Company had been established in 1915. The company specialized in the tanning of calfskins and sold most of its finished leather to shoemakers. Some small amounts of leather were sold to leather specialty makers. Calfskins were secured from both domestic and foreign sources. Following the outbreak of hostilities in September, 1939, however, the European market closed, and the company was forced to secure its calfskins from domestic packers and local butchers. The decline in available supplies brought about a substantial increase in the price of calfskins, as can be seen in Exhibit 1.

Exhibit 1

GROVER LEATHER COMPANY

Average Monthly Prices on Calfskins
Packers, City, 8–15 Pounds, per Pound, Chicago

	1935	1936	1937	1938	1939	1940
January	12.2	19.1	22.8	13.6	16.3	22.3
February	11.3	18.0	21.3	11.8	15.4	21.4
March	11.2	18.1	24.1	12.3	15.4	21.6
April	11.8	18.8	24.2	11.3	14.5	21.2
May	15.3	17.1	22.1	12.3	15.6	21.4
June	15.6	17.7	21.6	11.4	16.4	18.7
July	14.6	17.0	20.8	13.9	16.1	18.8
August	13.8	17.4	21.0	14.5	16.0	15.3
September	15.8	17.2	19.3	14.3	21.1	...
October	17.6	17.7	17.2	16.1	24.0	...
November	18.1	20.1	13.0	16.3	21.4	...
December	17.5	21.5	13.2	15.7	22.2	...
Average	14.6	18.3	20.0	13.6	17.8	20.1*

* 1940 average is computed through August.
Source: U.S. Bureau of Labor Statistics Monthly Bulletins.

Since its inception the company had used the customary lower-of-cost- or -market method of inventory valuation for raw skins and skins in process, while finished leather was valued at cost. A cost method of valuation was possible because it was the practice of the company to stamp the lot number on each skin in each lot received, and with this number to go by, the skins could be identified throughout the manufacturing process. Since the cost of each lot of skins was a known fact and since the number of skins in each lot was known, it was possible to arrive at an accurate figure for the cost per skin. By using this figure and accumulating the processing, tanning, and finishing costs on a per-skin basis, it was always possible to assign a cost figure to each skin regardless of its stage of manufacture.

When current market prices were below cost, the market price was substituted for the known raw material cost of raw skins and skins in process. No attempt was made, however, to place a market value on finished goods, for the quantity of such inventory on hand was typically very low, and it did not seem advisable to go to the trouble of calculating a market value for such a quantity.

During the summer of 1939, Mr. T. S. Thames, president of the Grover Leather Company, became sufficiently interested in the Lifo method to begin discussing it with other officials of the company. Mr. Thames' interest had been stimulated by releases from the Tanners Council, which was actively recommending the Lifo method. During the fall and winter of 1939 and the spring of 1940, officials of the company discussed the method from time to time, and Mr. Thames traveled to New York to talk with others in the industry. In the early spring of 1940, the company's auditors were asked to recompute the company's earnings for the past three years using the Lifo method of inventory valuation. This computation was completed in May, 1940, and with this as a basis, officials began serious discussion of whether or not to adopt the method. It was soon definitely decided not to adopt the method.

Several reasons led to this decision. In the first place, it was believed that no accounting system could improve on the lower-of-cost-or-market system that the company used in combination with the actual per-skin practice of valuation. This system permitted the company to report a profit figure which was considered conservative in that losses were anticipated while gains were not. Moreover, the inventory valuation figure either represented the actual investment which the company had made in the inventory or the current market value of the inventory, whichever was lower. In either instance, the valuation figure was a definite, worth-while fact. Such a situation seemed especially important in view of the fact that if the Lifo method were used, the inventory valuation figure would mean very little, for it would remain relatively constant from year to year and would not reflect either investment or current market value.

Another important factor behind the company's decision was the results shown by the three-year survey prepared by the auditors, which showed that the total profits for the three years when calculated by the Lifo method varied only slightly from the profits actually reported by the company (see Exhibit 2). Officials were interested particularly in the effect of the method on taxable income, and since the method apparently did not change the net income figure substantially, it was believed that there was little to be gained. The figures indicated that over the period in question, no tax saving would have resulted, and stockholders therefore would not have benefited.

Exhibit 2

GROVER LEATHER COMPANY

Summary of Estimated Effect of Adoption of Last-In, First-Out Inventory Method on Reported Net Profit

		Net Profit as Determined by the Last-In, First-Out Method Applied to			
	Net Profit as Shown by Books	Entire Inventory	Raw Material and In-Process Inventories Only	Raw Material Inventory Only	In-Process Inventory Only
1937	$ 20,589.68	$ 18,645.40	$ 51,748.29	$ 52,151.09	$ 19,879.65
1938	69,999.49	153,989.44	137,920.54	83,848.39	124,413.64
1939	135,274.67	35,813.92	46,356.79	90,689.44	95,541.12
	$225,863.84	$208,448.76	$236,025.62	$226,688.92	$239,834.41

Source: Auditors' Report.

An additional important reason for the company's decision was the fact that once having adopted the Lifo method, the company would have had to continue using it unless special permission was secured from the Commissioner of Internal Revenue to change back. It was generally agreed that the securing of such permission would be difficult if not impossible. Thus, if the method were to prove unsatisfactory in actual use, a particularly unfortunate condition would exist.

Another reason why company officials were opposed to the Lifo method was the current high price of calfskins. This calfskin price situation was considered important because of the freezing of inventory values which adoption of the method necessitated. The Revenue Act of

1939 stipulated that a company adopting the Lifo method of inventory valuation should calculate the average cost of the inventory on hand at the beginning of the tax year. This physical quantity of inventory was then to be valued forever after at this price, unless the quantity of inventory should decrease. If the size of the inventory decreased, the remaining amount was to be valued at the cost as originally determined. However, if the quantity of inventory was first decreased and subsequently increased again, the increase would be valued at the actual cost of that increased quantity. In short, the method called for the use of cost valuation with the concept of Lifo rigidly applied. Since the Grover Leather Company, like most leather firms, had a relatively stable quantity of inventory and did not liquidate its inventory to any considerable extent, adoption of the Lifo method meant that the inventory value would always remain very close to the cost value of the opening inventory for the first year in which the method was used. Thus if the method were adopted for the year ending October 31, 1940, the inventory value would always approximate the value of the inventory at cost on November 1, 1939. Inasmuch as the value of the inventory at cost on this date was considered rather high, officials hesitated to adopt the method, as they were definitely opposed to stating the inventory at a figure in excess of market value or actual cost, whichever was lower.

It was also pointed out that the United States Treasury had not as yet clearly defined its regulations pertaining to the use of the Lifo method and that it would be unwise to adopt the method before the regulations were definite.

Accounting officials were not in favor of the proposed method because they believed that a change would not only require the development of a new routine but would also increase accounting costs.

APPENDIX

THE LIFO METHOD OF INVENTORY VALUATION

Lifo, which stands for last-in, first-out, is a method of valuating inventory under which inventory is costed as if the units most recently purchased ("last-in") were the first units sold ("first-out"). Inventory is therefore assumed to consist of the older units and is valued at the cost of these units. If the number of physical units in inventory remains constant from period to period, the value of the inventory will also remain constant, regardless of what happens to the market price of the inventory items. It follows that under the Lifo method, cost of sales tends to reflect the cost of the items most recently purchased.

The Lifo inventory method normally does not reflect the physical flow of material, nor do its advocates claim that it has any relation to physical flow. Physically, material would be expected to move out of inventory on approximately a Fifo, or first-in, first-out basis; that is, the oldest stocks would normally be used up first. Advocates of Lifo contend, however, that in certain industries Lifo does match the *economic* flow of values since, they claim, the profit margin that really reflects business pricing decisions is the margin between sales and *current* costs, not the margin between sales and cost levels that existed at the time inventory was purchased. If this contention is correct, the Fifo system results in the reporting of false "inventory profits" during periods of rising cost prices since during these periods goods are sold at sales prices commensurate with current costs, while cost of goods sold reflects earlier, lower costs rather than current costs.

A frequently used example of what is meant by this economic flow is the following excerpt from the Report of the Special Committee on Inventories of the American Institute of Accountants (1936):

> A wagon maker has a wagon in stock which cost him $50, the selling price of which is $65 to yield him his desired profit of $15 per wagon. Before he sells the wagon he learns from the concern supplying him with his material of a price increase, the result of which is to make the reproduction cost of his wagon $60. By reason of this knowledge the wagon maker "marks up" his wagon to $75, at which figure he sells it for cash and builds a new wagon costing him $60. The net change resulting from the whole transaction is that his till shows $15 more cash than he had before.
>
> Now the advocate of "reproduction cost of sales" says to the wagon maker:
>
> The profit you made is $15, and the proper inventory price for the present wagon you have in stock is $50. That is the number of dollars of your capital invested in your stock-in-trade; the only change that you have effectively realized in that investment is the substitution of one wagon for another exactly like it—the same wagon, in fact, except only as regards physical identity.
>
> On the other hand, the advocate of "first-in, first-out" says to the wagon maker: Your profit is $25, although you may have only $15 more in cash to show for it. The other $10 is contained in the increased cost and value of the new wagon—$60 as against the old one at $50. You must not fail to recognize and to give effect to the price level change.
>
> Considering the other side of the problem, let us assume that after the above transaction the price level reverted to its original status, thus consummating the economic cycle; accordingly the wagon at present in stock, which actually had cost $60 to build (but was inventoried at either $50 or $60, according to the procedure followed) is sold for $65 and replaced in stock by one which cost $50 to build. Now, under either procedure the latest wagon will be inventoried at $50. The profit on the second transaction, however, will have been $15 according to the "reproduction cost of sales" advocate, or $5 according to the "first-in, first-out" advocate. The aggregate profit on the two transactions, of course, will be the same in either case, but the periodic distribution will differ.

The "false profit" argument implies that an underlying objective of Lifo is to postpone the recognition of income until the cost factors used have been replaced; that is, one virtue of the Lifo method is its tendency to restrict the reporting of periodic profits to amounts which might be made available to stockholders without impairing the scope and intensity of the operations of a going concern. Advocates also argue that such restrictions in reported profits serve to conserve funds by reducing income taxes.

Opponents of Lifo—while recognizing that it is not good managerial policy to regard funds needed to maintain the level of operations as representing disposable income—attack the Lifo argument on the grounds that it confuses two distinct processes, the determination of income, and the utilization of income. They argue that income may be realized and valid even though such earnings are to be subsequently invested in inventories or other assets. They also point out that the Lifo method falls short of achieving the underlying objective in that costs of only the most recent acquisitions are charged against sales rather than the total cost of replacing all the items sold.

No one argues that Lifo is applicable to every company; rather it is recommended only when there is a definite relationship between selling price and *current* cost. For example, if a retailer sets his price by adding a fixed markup to the invoice cost of specific units of merchandise, and if he usually can sell the merchandise at this price, his profit is based not on replacement cost but rather on his invoice cost, and, therefore, he makes no transitory "inventory profit" under a Fifo system. If, on the other hand, he finds it necessary or possible to change his retail prices as soon as, or shortly after, a change in wholesale prices occurs, his cost may be considered to be the replacement or Lifo cost.

A close correspondence between changes in selling prices and charges in current costs may reflect a general change in the value of money in the economy. If this is the case, it is argued that it makes little sense to state the revenue component of profit at the current value of the dollar while stating the principal expense component, cost of goods sold, in terms of a different kind of dollar. On the other hand, if the facts are that in a particular company the profit margin has really changed, for reasons having nothing to do with fluctuations in price levels, the use of Lifo may conceal such changes.

In addition to situations where there is a correspondence between current costs and selling prices, other conditions under which Lifo is frequently thought to be particularly applicable are described as follows:

1. Material cost should constitute a relatively large part of total cost.
2. The inventory should be relatively large.
3. The manufacturing process should be relatively long. (This is a variation of No. 2, since a long manufacturing process means a large work in process inventory.)
4. The inventory should be fungible; that is, one unit should be physically identical with another. (This consideration has gradually become less important than it used to be, since methods have been worked out for dealing with heterogeneous units by the use of index numbers. Some are described below.)
5. The company does not eliminate inventory profits by hedging.
6. The company is not in the business of speculating on price changes.

Tax Considerations

Since 1939 the use of Lifo has been permitted for calculation of taxable income. The federal income tax regulations on Lifo include the following points:

1. The basic principle of the law is that the method of inventory valuation used must (*a*) clearly reflect income and (*b*) conform to accepted accounting practice in the trade or business.

2. Application to use the Lifo method must be made to the Commissioner of Internal Revenue. The application must describe clearly the goods to which the method will be applied. The Commissioner may require that Lifo be used in connection with goods other than those designated in the application if such is necessary to reflect income clearly.

3. The first opening inventory (i.e., the opening inventory at the time the shift to Lifo is made) must be valued at cost and is considered to have been acquired all at one time at a unit cost equal to the actual cost of the aggregate inventory divided by the number of units on hand.

4. The closing inventory is considered as consisting of:
   - *a*) Opening inventory to the extent thereof, plus
   - *b*) Goods acquired during the year, which can be valued at either
     - (1) Most recent invoice price,
     - (2) Average cost of goods purchased during the year,
     - (3) Cost of goods purchased in year in order of acquisition, or
     - (4) Any other method which clearly reflects income.

5. No other method of inventory valuation may be used in annual statements for any other purpose, including reports to stockholders, creditors, etc. Interim statements using other methods are permitted, however.

6. Once the method has been adopted, the taxpayer must continue to use it unless the Commissioner requires a change to another method or authorizes such a change upon application of the taxpayer.

Example

Illustration 13–1 illustrates the effect of the Lifo method on profit and on inventory valuation as contrasted with the effect of the conventional Fifo method. The situation illustrated is the simplest possible, namely where:

1. Selling price is immediately and exactly adjusted for changes in material cost;

2. There is no change in inventory quantity, that is, as soon as a unit is sold, it is replaced in inventory by another unit;

3. Sales *volume* each year is constant (at 1,000 units), hence purchases are also constant;

4. One hundred per cent of the product cost is material cost; and

5. Inventory turnover is 1.

The following points should be noted from the calculations shown in Illustration 13–1. There was no difference in *total* profits under Lifo and under Fifo over the complete cycle. Under the conventional Fifo method profits were high in years of high prices and low in years of low prices, even though the quantity sold and the margin between selling price and current material cost remained constant; also inventory values fluctuated widely and inventory was at its highest price at the very top of the cycle. Under the Lifo method, profit and inventory values were the same in each year; in one year, 1954, inventory was valued at more than "market."

Illustration 13–1

GROSS PROFIT CALCULATION UNDER FIFO AND LIFO

	(1) Inventory, January 1	(2) Purchases	(3) Inventory, December 31	(4) Cost of Sales*	(5) Sales†	(6) Gross Profit
		UNDER FIFO				
1951	1,000 at $1.00	1,000 at $1.00	1,000 at $1.00	$1,000	$2,000	$1,000
1952	1,000 at 1.00	1,000 at 1.50	1,000 at 1.50	1,000	2,500	1,500
1953	1,000 at 1.50	1,000 at 2.00	1,000 at 2.00	1,500	3,000	1,500
1954	1,000 at 2.00	1,000 at 0.50	1,000 at 0.50	2,000	1,500	(500)
1955	1,000 at 0.50	1,000 at 1.00	1,000 at 1.00	500	2,000	1,500
				Total Five-Year Profit		$5,000
		UNDER LIFO				
1951	1,000 at $1.00	1,000 at $1.00	1,000 at $1.00	$1,000	$2,000	$1,000
1952	1,000 at 1.00	1,000 at 1.50	1,000 at 1.00	1,500	2,500	1,000
1953	1,000 at 1.00	1,000 at 2.00	1,000 at 1.00	2,000	3,000	1,000
1954	1,000 at 1.00	1,000 at 0.50	1,000 at 1.00	500	1,500	1,000
1955	1,000 at 1.00	1,000 at 1.00	1,000 at 1.00	1,000	2,000	1,000
				Total Five-Year Profit		$5,000

* Beginning inventory, plus purchases, less ending inventory, each being assumed in this example to be 1,000 units. Under Fifo, cost of sales will equal the value of the beginning inventory, since it is assumed that the units sold were the oldest units on hand and equal in units to purchases. Under Lifo, cost of sales will equal the value of purchases, since it is assumed that the units sold were the units most recently purchased.

† 1,000 units times sales price per unit, which is assumed to be the current purchase price +$1.

Basic Arguments

A more generalized argument in favor of Lifo goes beyond the limitation of exact agreement of cost and selling price, as was presumed in the example given above. The real issue, from this point of view, is whether or not the company has properly counted its *current* costs against its *current* income in figuring profit. In periods of rising prices the company does have increased costs in maintaining its inventory position, and current sales should be charged with a cost of goods sold that reflects these current costs. To do otherwise, in Professor Slichter's words, is to count a cost as a profit and to pay stiff taxes on the amounts so reported.

This broader view of Lifo looks on inventory as a necessary stock in trade, just as essential to operations as are plant or facilities. Accordingly, such an investment ought *not* to be revalued on the balance sheet with every cyclical swing of prices. As Illustration 13–1 demonstrates, the Lifo method tends to stabilize both profits and the reported value of inventory as prices change.

Opponents of Lifo argue that one of managements' primary responsibilities is effective utilization of the economic resources at their disposal. They admit that over sustained periods of price level adjustments, conventional accounting fails to reflect the economic values of such resources as plant and inventory, but they claim that Lifo confuses, rather than clarifies, the picture. Under Lifo, inventory is valued forever in terms of whatever the price level happened to be at the time Lifo was introduced. As time goes on and price levels change, the inventory figure under Lifo departs further and further from reality, becoming neither a reflection of actual purchase costs nor of current costs. Thus, it is claimed, Lifo makes the inventory figure on the balance sheet of dubious usefulness to management or to others who attempt to appraise the financial status of the business.

As can be seen from the above, advocates of Lifo are thinking primarily of its effect on the income statement and are willing to accept the fact that the usefulness of the balance sheet inventory figure may be impaired. Opponents of Lifo are thinking primarily of its effect on the balance sheet; they admit that the conventional Fifo income statement may not reflect the flow of economic values, although they do not grant that this is necessarily bad.

Use of Index Numbers

If the *physical* volume of inventory does not change, the Lifo method necessarily results in an unchanging dollar value of inventory. And if physical size of inventory does increase, the Lifo method necessarily gives a dollar figure for inventory that is equal to the opening Lifo inventory plus the *increase* in physical inventory, priced in accordance with one of the methods listed in 4(*b*) above (for if physical inventory rises, it is because more units were bought during the past period than were used or sold). Because of this relationship with physical volume of inventory, a method of Lifo using price index numbers has been developed.

If beginning dollar inventory is $780,000 in 1950 prices and a year later becomes $880,000 in 1951 prices (thus basically a Fifo method), and the appropriate price indexes are 100 in 1950 and 110 in 1951, we know the change in physical inventory is measured by the *deflated* values 780,000/100 and 880,000/110, i.e., $780,000 vs. $800,000, both in 1950 prices. Thus there has been a $20,000 increase (in 1950 prices), but under Lifo this *increment* should be measured in 1951 prices; so this portion must be reinflated, which gives a figure of $20,000 × 110 per cent, or $22,000. Thus the new inventory figure on a Lifo basis would be $780,000 plus $22,000, or $802,000. If inventory subsequently shrinks, the layers of extra inventory accumulated in the past must be "peeled off," layer by layer.

Practically, the composition of the Lifo index numbers should match the make-up of the inventory, but even with approximate figures a satisfactory Lifo value is obtained. To get good results, the adjustments are made separately to various sections of the inventory; e.g., inventories of individual departments in a department store. The principle of the index number approach has been approved by the tax authorities, and many department stores are now reporting inventory on a Lifo basis, using special government index numbers published for the purpose.

Variations

In applying the general notion of Lifo to a particular situation, several variations are possible:

1. Lifo may be applied to all inventories, or only to the raw material inventory, or only to certain items in inventory.

2. Products may be run through the cost accounting mechanism at Lifo values, or the detailed cost records may show Fifo or specific invoice values, with an adjustment to Lifo being made only at the end of the accounting period.

3. Inventory changes may be calculated annually, or monthly, or even daily.

Usually the differences in results between the several methods of applying Lifo are small compared with the basic difference between Lifo and Fifo, but the fact that these differences in the application of Lifo exist is one reason why Lifo is criticized. Opponents argue that Lifo itself violates the fundamental doctrine of "consistency," since it makes it difficult to compare the earnings of a company that uses Lifo with the earnings of a company that uses Fifo; variations within the general Lifo idea make "confusion worse confounded."

Other Considerations

The decision to adopt or not to adopt Lifo may be based on a number of considerations, an important one of which is often the possibility of tax savings. Although it is easy to calculate whether or not tax savings will result in the year in which Lifo is adopted, it is impossible to determine whether the net effect over a number of years will be a gain or whether it will be a loss. The existence and amount of any future tax savings depends largely upon future price movements, fluctuations in tax rates, and variations in the amounts and kinds of physical inventories held at the end of each taxable year. Although over a period of years total income computed under either the Lifo or Fifo method may be the same, it does not follow that tax liabilities will also be the same. Generally, total tax liability tends to be greater under Fifo than under Lifo if the following conditions exist: if income is taxed progressively, if undistributed profits or excess profits taxes exist, if income tax rates are higher in years of rising prices than in years of falling prices, or if there is no provision for carry-back of losses. Although tax savings under Lifo are likely in periods of rising prices, they are by no means certain if prices are at their peak when the change to Lifo is made, for tax losses after prices begin to fall may be greater than the initial tax savings when prices were rising.

Another consideration entering into the decision to adopt Lifo concerns anticipated price movements. The possibility of securing tax savings, of course, depends in part upon price movements; but, in addition, future prices become important in relation to inventory valuation. There is a reluctance on the part of most firms to allow inventories to be frozen at prices above market by adopting Lifo in periods of falling prices.

CASE 13–2. UNITED STATES STEEL CORPORATION[1]

For several years prior to 1946 the management of United States Steel Corporation had been concerned with the effects upon the company's capital replacement program of the steady rise in the general price level since the late 1930's. This concern, shared by a major segment of American business management, arose chiefly from the realization that the amounts being deducted from earnings to cover the depreciation and amortization of plant and equipment were not sufficient to provide for the replacement of such facilities when they were worn out or became obsolete. The inadequacy of the amounts set aside could be traced directly to the fact that the costs of replacing capital goods had risen, along with the general price level, while the company's allowances for depreciation were still being made on the basis of the original cost of plant and equipment which had been acquired when the price level was markedly lower. Executives of U.S. Steel believed that if they failed to take action on this problem, they were not discharging one of the major responsibilities placed upon them by the company's stockholders—the responsibility for the preservation of the capital of the corporation.

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[1] This case was developed primarily from published material.

The inadequacy of the depreciation allowance could have two main consequences: (1) it could lead to selling prices that were not high enough to permit the recovery, through the sales of its goods and services, of the real costs of wear and exhaustion of facilities used to provide those goods and services simply by making too small an allowance for, or completely omitting, that element in arriving at the true costs of its products; and (2) it could result in a misleading net profit figure which could be used as an argument for higher wages or dividend payments than actually were warranted by the company's condition. The management believed that unless price, wage, and dividend policies were predicated upon a full recognition of the need to replace worn-out plant and equipment, the company would be dissipating its capital in the course of its normal operations.

The 1947 Change

The abrupt upturn of prices following the relaxation of most government price controls in late 1946 and early 1947 brought into sharper focus than ever before the problem of providing for the replacement of worn-out facilities. The following table, based on virtually identical facilities acquired by U.S. Steel in 1940 and 1947, gives some indication of how costs had increased for specific items of equipment and types of construction during that seven-year period:

	Percentage Increase 1947 over 1940
Wire drawing machine	91
Standard electric crane	105
Reheating furnace	108
Blast furnace	105
By-product coke ovens	150
Mine locomotive	44
Large electric motor	50
Continuous rolling mill	84
Concrete construction	124
Brick construction	250

As a step toward stating depreciation in an amount which would recover in current dollars of diminished buying power the same purchasing power represented by the original plant expenditure, the company therefore deducted, in arriving at net income for 1947, an amount of $26,300,000 over and above its regular depreciation charge. Although the federal tax authorities would not allow the extra depreciation as a deduction in arriving at taxable income for that year, the company's executives considered it essential that they recognize this element of cost in arriving at a measure of income to be used in other matters of company management.

In its 1947 annual report the management stated that "while awaiting accounting and tax acceptance, U.S. Steel believed that it was prudent for it to give some recognition to increased replacement costs rather than to sit idly by and witness the unwitting liquidation of its business should inadequate recording of costs result in insufficient resources to supply the tools required for sustained production."

The additional depreciation charge was shown in the company's income statement as a seperate item in the section under "Wear and Exhaustion of Facilities" and labeled, "Added to Cover Replacement Cost"; it was shown in the balance sheet, on the liability side, as "Reserve for Replacement of Properties." The sum of $26,300,000, which amounted to approximately 30 per cent of the regular depreciation based on original cost, was arrived at partly on the basis of cost increases actually experienced by the company and partly through study of construction cost index numbers (notably the *Engineering News-Record Index*). The management pointed out that, although the amount was actually much less than that which could be substantiated by actual cost increases, it was all that was deemed appropriate in view of the newness of the application of such a method of computing depreciation.

Reaction to the Change

The company's independent auditors took exception to this practice. They stated in their report to the stockholders for 1947 that the corporation had included in costs additional depreciation of $26,300,000 "in excess of the amount determined in accordance with the generally accepted accounting principle heretofore followed of making provision for depreciation on the original cost of facilities."

Opinion among professional economists and accountants on depreciation during an extended period of rising prices was divided. U.S. Steel drew support for its position from economist Sumner H. Slichter:

> An enterprise which expects to continue in business must obviously replace its plant and equipment as they wear out. If it distributes in the form of divi-

> dends, higher wages, or lower prices, income needed to replace plant and equipment, the enterprise is, in effect, living off its capital, because it will have to bring in new capital to maintain its productive capacity. In other words, only after management has set aside enough of current income to maintain the productive capacity of the enterprise, does it have funds which may be properly regarded as available for dividends, higher wages, or lower prices.[2]

Carman G. Blough, director of research, American Institute of Accountants, recognized the need for consideration of the problem of plant replacement by management, but he disagreed as to the accounting treatment that should be prescribed:

> There can be no argument but that a going concern must be able to replace its productive assets as they are used up if it is to continue to do business. It is also important for management to understand that the difference between cost and estimated replacement value may be significant in determining production and pricing policies. It does not follow, however, that the excess of the cost of replacement over the cost of existing assets should be accounted for as current charges to income. All who have dealt with appraisal values know how very difficult it is just to determine current replacement costs, but the most striking difficulty in this respect is the impossibility of predicting what will be the eventual cost of replacing a productive asset. How many men are prepared to state what the price level will be two years from today, to say nothing of trying to guess what it will be five or ten years hence when many of these assets are to be replaced?[3]

The American Institute of Accountants' Committee on Accounting Procedure issued, in late 1947, *Accounting Research Bulletin No. 33,* in which it stated that it disapproved "immediate write downs of plant cost by charges against current income in amounts believed to represent excessive or abnormal costs occasioned by current price levels." (See Appendix A, p. 257 for a fuller statement of the committee's view.)

The Securities and Exchange Commission, in its 1949 *Annual Report,* formally stated the position which it had already indicated informally that it would take on the question of depreciation during periods of rising prices:

> The conclusion reached was that depreciation charges in financial statements filed with the Commission should continue to be based upon cost. Revisions of financial statements on file have been made in accordance with this conclusion. In some cases accounting recognition has been given to the high rates of production enjoyed in postwar years by accelerating depreciation charges in periods during which productive capacity was used in excess of normal average production over a representative period of years. Similarly, the amortization of plant

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[2] From testimony presented before the Joint Committee on the Economic Report of the President, Washington, D.C., December 6, 1948.

[3] "Replacement and Excess Construction Costs," *The Journal of Accountancy,* Vol. LXXXIV (October, 1947), p. 335.

costs incurred to capture a temporarily expanded demand was deemed to comply with the generally applicable accounting principle of matching cost with revenues. In such cases a clear explanation of the circumstances justifying the early amortization of costs has been obtained.

The 1948 Retreat

United States Steel Corporation continued through the first three quarters of 1948 its practice of charging additional depreciation to cover higher costs of replacing worn-out facilities, and in view of the continued increase in the cost of facilities during 1948, advanced the additional charge from 30 per cent to 60 per cent of the depreciation based on original cost.

In the release of its quarterly statements for the third quarter of 1948, however, the company stated that, in view of the position taken by the American Institute of Accountants and the discussions between the corporation and the Securities and Exchange Commission, further study was being made in an effort to agree upon principles satisfactory to the commission for "determining and reflecting additional wear and exhaustion cost."

In its annual report for 1948 U.S. Steel announced that it was abandoning the policy adopted in 1947 of charging to costs an amount over and above the regular depreciation on original cost and was substituting in its place a method of charging "accelerated depreciation on cost." The following quotation from the notes to the financial statements in the 1948 annual report provides a brief description of the formula to be used in determining the amount of annual charge for accelerated depreciation:

> The accelerated depreciation is applicable to the cost of postwar facilities in the first few years of their lives when economic usefulness is greatest. The amount thereof is related to the excess of current operating rates over U.S. Steel's long-term peacetime average rate of 70% of capacity. The annual accelerated amount is 10% of the cost of facilities in the year in which the expenditures are made and 10% in the succeeding year, except that this amount is reduced ratably as the operating rate may drop, no acceleration being made at 70% or lower operations. The accelerated depreciation is an addition to the normal depreciation on such facilities, but the total depreciation over their expected lives will not exceed the cost of the facilities.

This method was made retroactive to January 1, 1947, and there was included, in the $55,335,444 deducted for accelerated wear and exhaustion of facilities for 1948, an amount of $2,675,094 to cover a deficiency in the $26,300,000 sum reported in 1947 as "depreciation added to cover replacement cost." In other words, the new method when applied to the 1947 situation resulted in a deduction that exceeded the figure actually reported in 1947. It was again pointed out at this time that the accelerated depreciation was not "presently deductible for federal income tax purposes."

Reactions to the 1948 Change

The company's independent auditors apparently interpreted the concept of accelerated depreciation as being within the American Institute of Accountants' standards as a "systematic basis related to economic usefulness" (See Appendix A, p. 257); for they stated in their report to the stockholders for 1948 that they "approved" the new policy.

The management's convictions on the change in policy were, however, clearly set forth by the chairman of the board of directors in the following quotation from the company's annual report for 1948:

> U.S. Steel believes that the principle which it adopted in 1947 and continued in 1948, is a proper recording of the wear and exhaustion of its facilities in terms of current dollars as distinguished from the dollars which it originally expended for those facilities. However, in view of the disagreement existing among accountants, both public and private, and the stated position of the American Institute of Accountants, which is supported by the Securities and Exchange Commission, that the only accepted accounting principle for determining depreciation is that which is related to the actual number of dollars spent for facilities, regardless of when or of what buying power, U.S. Steel has adopted a method of accelerated depreciation based on cost instead of one based on purchasing power recovery.

Subsequent Developments

United States Steel Corporation, continuing its policy of charging accelerated depreciation, deducted an amount of $22,045,743 for that purpose in arriving at net income for 1949. In its annual report for that year the company restated its belief that "a manufacturer should be able to recover out of receipts from customers, through depreciation and through income remaining for reinvestment after equitable dividends, an amount sufficient to replace and keep modern his plant and equipment so as continuously to retain his productive capacity on a competitive basis." It was also pointed out in that report that by depreciation the company meant "depreciation on either a replacement or an accelerated basis whereby sufficient dollars are recovered currently to provide the same purchasing power as so-called normal depreciation dollars commanded when they were initially expended."

Deductions for accelerated depreciation for 1947 through 1952 totaled slightly more than $201 million; none of this sum, however, had been allowed in computing taxable income during that period.

In its annual report for 1952 the company once again expressed its opinion on the proposition of charging depreciation on a basis that would permit the replacement of worn-out or obsolete facilities, this time with particular reference to tax policy. In that report, the company commented that "so long as depreciation that is deductible for tax purposes is measured by the relatively smaller number of dollars of greater buying power expended in an earlier period, it will be inadequate to recover the original purchasing power invested in the facilities consumed in production. Real wear and exhaustion costs are thus understated, real profits are overstated, and there results an erosion of capital through taxation."

Income tax provisions relating to depreciation are described briefly in Appendix B, page 260.

APPENDIX A

AMERICAN INSTITUTE OF ACCOUNTANTS EXCERPT FROM ACCOUNTING RESEARCH BULLETIN NO. 43

1. In December, 1947, the committee issued Accounting Research Bulletin No. 33, dealing with the subject of depreciation and high costs. In October, 1948, it published a letter to the membership reaffirming the opinion expressed in the bulletin.

2. The subject is one of continuing importance. The committee once more expresses its approval of the basic conclusions asserted in both publications, but in view of the many requests received for further consideration of various aspects of the problem has placed the subject on its agenda for further study.

3. Accounting Research Bulletin No. 33 read as follows:

4. "The American Institute of Accountants committee on accounting procedure has given extensive consideration to the problem of making adequate provision for the replacement of plant facilities in view of recent sharp increases in the price level. The problem requires consideration of charges against current income for depreciation of facilities acquired at lower price levels.

5. "The committee recognizes that business management has the responsibility of providing for replacement of plant and machinery. It also recognizes that, in reporting profits today, the cost of material and labor is reflected in terms of 'inflated' dollars while the cost of productive facilities in which capital was invested at a lower price level is reflected in terms of dollars whose purchasing power was much greater. There is no doubt that in considering depreciation in connection with product costs, prices, and business policies, management must take into consideration the probability that plant and machinery will have to be replaced at costs much greater than those of the facilities now in use.

6. "When there are gross discrepancies between the cost and current values of productive facilities, the committee believes that it is entirely proper for management to make annual appropriations of net income or surplus in contemplation of replacement of such facilities at higher price levels.

7. "It has been suggested in some quarters that the problem be met by in-

creasing depreciation charges against current income. The committee does not believe that this is a satisfactory solution at this time. It believes that accounting and financial reporting for general use will best serve their purposes by adhering to the generally accepted concept of depreciation on cost, at least until the dollar is stablized at some level. An attempt to recognize current prices in providing depreciation, to be consistent, would require the serious step of formally recording appraised current values for all properties, and continuous and consistent depreciation charges based on the new values. Without such formal steps, there would be no objective standard by which to judge the propriety of the amounts of depreciation charges against current income, and the significance of recorded amounts of profit might be seriously impaired.

8. "It would not increase the usefulness of reported corporate income figures if some companies charged depreciation on appraised values while others adhered to cost. The committee believes, therefore, that consideration of radical changes in accepted accounting procedure should not be undertaken, at least until a stable price level would make it practicable for business as a whole to make the change at the same time.

9. "The committee disapproves immediate write-downs of plant cost by charges against current income in amounts believed to represent excessive or abnormal costs occasioned by current price levels. However, the committee calls attention to the fact that plants expected to have less than normal useful life can properly be depreciated on a systematic basis related to economic usefulness."

10. The letter of October 14, 1948, was addressed to the members of the Institute and read as follows:

11. "The committee on accounting procedure has reached the conclusion that no basic change in the accounting treatment of depreciation of plant and equipment is practicable or desirable under present conditions to meet the problem created by the decline in the purchasing power of the dollar.

12. "The committee has given intensive study to this problem and has examined and discussed various suggestions which have been made to meet it. It has solicited and considered hundreds of opinions on this subject expressed by businessmen, bankers, economists, labor leaders, and others. While there are differences of opinion, the prevailing sentiment in these groups is against any basic change in present accounting procedures. The committee believes that such a change would confuse readers of financial statements and nullify many of the gains that have been made toward clearer presentation of corporate finances.

13. "Should inflation proceed so far that original dollar costs lose their practical significance, it might become necessary to restate all assets in terms of the depreciated currency, as has been done in some countries. But it does not seem to the committee that such action should be recommended now if financial statements are to have maximum usefulness to the greatest number of users.

14. "The committee, therefore, reaffirms the opinion it expressed in Accounting Research Bulletin No. 33, December, 1947.

15. "Any basic change in the accounting treatment of depreciation should await further study of the nature and concept of business income.

16. "The immediate problem can and should be met by financial management. The committee recognizes that the common forms of financial statements

may permit misunderstanding as to the amount which a corporation has available for distribution in the form of dividends, higher wages, or lower prices for the company's products. When prices have risen appreciably since original investments in plant and facilities were made, a substantial proportion of net income as currently reported must be reinvested in the business in order to maintain assets at the same level of productivity at the end of a year as at the beginning.

17. "Stockholders, employees, and the general public should be informed that a business must be able to retain out of profits amounts sufficient to replace productive facilities at current prices if it is to stay in business. The committee therefore gives its full support to the use of supplementary financial schedules, explanations or footnotes by which management may explain the need for retention of earnings."

Six members of the committee, Messrs. Andrews, Peloubet, Peoples, Smith, Wellington, and Williams, dissented to adoption of section (a) of chapter 9.

The six dissenting members object to the reprinting, in this section, of Bulletin No. 33 of December, 1947, and the reaffirming letter of October 14, 1948. That bulletin was issued to check the extension of certain then-emerging practices and it was successful in that purpose. However, Bulletin No. 33 contains assertions which are not now appropriate and should be eliminated, notably:

> (a) "An attempt to recognize current prices in providing depreciation . . . would require the serious step of formally recording appraised current values . . . and consistent depreciation charges based on the new values" (par. 7 of this section).

Those dissenting believe this is not the only method which may be followed—a conclusion also reached by the Study Group on Business Income (see page 61 of its report).*

> (b) ". . . consideration of radical changes in accepted accounting procedure should not be undertaken, at least until a stable price level would make it practicable for business as a whole to make the change at the same time." (par. 8)

This statement virtually precludes changes in accounting practice in so far as the monetary unit is concerned and is inconsistent with the paragraphs on Accounting and the Corporate System in the introduction to this volume.

> (c) The warnings (in paragraphs 5, 6, 16 and 17) to management as to the use of profits.

Such warnings are irrelevant; it is no part of the accountant's function to tell management what it may or may not properly do with income after it has been determined.

Those dissenting believe that acceptable accounting practices should comprehend financial statements to stockholders, employees, and the public designed to reflect those concepts of cost and net income which are recommended in paragraph 5 to management in determining product costs, prices, and business policies. They question whether net income can properly be so designated if appropriations therefrom, as suggested in paragraph 6, are needed to preserve capital invested in plant.

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* Study Group on Business Income, *Changing Concepts of Business Income,* New York: The Macmillan Co., 1952. 160 pp.

They believe that plant may continue to be carried in the balance sheet at historical cost with deduction for depreciation based thereon. In addition to historical depreciation, a supplementary annual charge to income should be permitted with corresponding credit to an account for property replacements and substitutions, to be classified with the stockholders' equity. This supplementary charge should be in such amount as to make the total charge for depreciation express in current dollars the exhaustion of plant allocable to the period. The supplementary charge would be calculated by use of a generally accepted price index applied to the expenditures in the years when the plant was acquired. The last sentence of paragraph 7 would then be no longer valid; the usefulness of financial statements would be enhanced without sacrifice of presently existing comparability.

APPENDIX B

EXCERPTS FROM 1954 INTERNAL REVENUE CODE

Sec. 167. Depreciation

(a) *General Rule.*—There shall be allowed as a depreciation deduction a reasonable allowance for the exhaustion, wear and tear (including a reasonable allowance for obsolescence)—

(1) of property used in the trade or busines, or

(2) of property held for the production of income.

(b) *Use of Certain Methods and Rates.*—For taxable years ending after December 31, 1953, the term "reasonable allowance" as used in subsection (a) shall include (but shall not be limited to) an allowance computed in accordance with regulations prescribed by the Secretary or his delegate, under any of the following methods:

(1) the straight line method,

(2) the declining balance method, using a rate not exceeding twice the rate which would have been used had the annual allowance been computed under the method described in paragraph (1).

(3) the sum of the years-digits method, and

(4) any other consistent method productive of an annual allowance which, when added to all allowances for the period commencing with the taxpayer's use of the property and including the taxable year, does not, during the first two-thirds of the useful life of the property, exceed the total of such allowances which would have been used had such allowances been computed under the method described in paragraph (2).

Nothing in this subsection shall be construed to limit or reduce an allowance otherwise allowable under subsection (a).

(c) *Limitations on Use of Certain Methods and Rates.*—Paragraphs (2), (3), and (4) of subsection (b) shall apply only in the case of property (other than intangible property) described in subsection (a) with a useful life of 3 years or more—

(1) the construction, reconstruction or erection of which is completed after December 31, 1953, and then only to that portion of the basis which is properly attributable to such construction, reconstruction, or erection after December 31, 1953, or

(2) acquired after December 31, 1953, if the original use of such property commences with the taxpayer and commences after such date.

(d) *Agreement as to Useful Life on Which Depreciation Rate Is Based.*—Where, under regulations prescribed by the Secretary or his delegate, the taxpayer and the Secretary or his delegate have, after the date of enactment of this title, entered into an agreement in writing specifically dealing with the useful life and rate of depreciation of any property, the rate so agreed upon shall be binding on both the taxpayer and the Secretary in the absence of facts or circumstances not taken into consideration in the adoption of such agreement. The responsibility of establishing the existence of such facts and circumstances shall rest with the party initiating the modification. Any change in the agreed rate and useful life specified in the agreement shall not be effective for taxable years before the taxable year in which notice in writing by registered mail is served by the party to the agreement initiating such change.

(e) *Change in Method.*—In the absence of an agreement under subsection (d) containing a provision to the contrary, a taxpayer may at any time elect in accordance with regulations prescribed by the Secretary or his delegate to change from the method of depreciation described in subsection (b) (2) to the method described in subsection (b) (1).

. . . .

Note: Sec. 167(f), 1011, and 1012 provide that depreciation is to be based on the "cost of such property."

CASE 13–3. BEALE COMPANY

Early in November, 1955, the new president of the Beale Company was eagerly waiting the completion of the profit and loss statement for October. He knew that October sales had exceeded those for September by more than $50,000, and he was anxious to see how much of this increased sales volume was reflected as extra profit. But when the report came in, it showed an over-all loss of $5,015 (Exhibit 1). In September, profit had been $3,509.

The president immediately thought some mistake had been made and called in the controller for an explanation. The controller said the figures were correct, but that in October the company had not produced anywhere near its normal volume and hence the charge for unabsorbed burden had decreased the profit more than the added sales had increased it. He said that if the rate of sales were always the same as the rate of factory production, the kind of distortion that was bothering the presi-

Exhibit 1

BEALE COMPANY

Condensed Income Statement as Actually Prepared October, 1955

Sales	$336,903	
Cost of sales at standard	178,168	
Standard Gross Margin		$158,735
Less: Manufacturing variances:		
Labor	$ 4,321*	
Material	3,972	
Overhead:		
Volume	26,870	
Spending	1,347	
		27,868
Gross Profit		$130,867
Selling costs:		
Selling expenses	$ 84,514	
Sales taxes	3,236	
Freight allowed	7,195	
Total Selling Costs		94,945
Operating Profit before Administration Costs		$ 35,922
Administrative costs:		
General administrative expenses	$ 20,640	
Research expenses	5,879	
Total Administrative Costs		26,519
Operating Profit		$ 9,403
Other income or charges		14,418
Loss, Current Month		$ 5,015

* Credit variance.

dent would not appear. When factory operations were out of phase with sales operations, however, such distortions were almost certain to result, so long as the company followed the commonly practiced accounting convention of charging or crediting periodic under- or overabsorbed factory overhead to the current profit and loss account.

The president reacted strongly to the controller's explanations: "I don't care a hoot for your accounting conventions. But I do know this: when our sales go up, with other things reasonably equal, I expect our profit to increase. If your reports can't show so simple a thing as that, why do we spend so much money on your department?"

As a matter of fact, the controller had been thinking about the problem that disturbed the president. He concluded that the solution was to take a radically different approach to the accounting treatment of overhead; namely, to charge all fixed overhead costs for the month to the current operating statement rather than absorbing them as a part of product costs. If this were done, there would be no problem of heavy over- or underabsorbed overhead as the volume of operations changed. Cost of goods sold would then reflect only the nonfixed factory costs, i.e., variable costs, which the controller called "direct costs."

As an illustration of how his proposal would work out, the controller reworked the company's figures for October with the startling result that instead of loss of $5,015, the statement showed a profit of $11,028 (Exhibit 2). When this revised statement was shown to the president, he first exclaimed, "That's more like it." Then he hesitated and started to speculate: "But this means more taxes and more demands for wage increases and dividends and what-all. Maybe your idea isn't so good after all."

The controller was in favor of the new plan largely because of its simplified accounting procedures. For one thing there would be no fixed overhead costs in the standard cost figures for different products but only the three classes of "direct costs": (*a*) the cost of raw materials, (*b*) direct labor, and (*c*) the portion of the outlay for manufacturing expenses which varies directly with productive activity. Omission of fixed overhead costs from the individual product costs would mean that the vexing and expensive task of working out an acceptable allocation of overhead to each product would be unnecessary. Inasmuch as many of these prorations had in fact become out of date, the controller was further attracted to his plan by the possibility that the expense of the needed overhauling of the figures might be avoided.

Exhibit 2

BEALE COMPANY

Condensed Income Statement (Proposed Style), October, 1955

Sales		$336,903	
Standard "variable" cost of sales		123,133	
Gross Margin above Variable Costs			$213,770
Selling expenses:			
Selling expenses		$ 84,514	
Sales taxes		3,236	
Freight allowed		7,195	
Total Selling Expenses			94,945
Merchandising Margin			$118,825
Administrative expenses:			
General administrative expenses		$ 20,640	
Research expenses		5,879	
Total			26,519
Additional factory expenses:			
Fixed factory overhead		$ 65,862	
Manufacturing variances:			
Labor variance	$4,321*		
Material variance	3,972		
Overhead variance (spending)	1,347	998	66,860
Operating Margin			$ 25,446
Other income or charges			14,418
Profit, Current Month			$ 11,028

* Credit variance.

The controller also believed the proposed system would greatly increase management's focus on the *controllable* portion of costs by spotlighting the variable elements. Since the fixed costs pertaining to factory operations tend to fall into quite a different category from that of the variable costs, he thought they should be segregated anyway. By way of analogy he suggested that, like a retail store, a manufacturing company "purchases" its product for a known "direct cost." Consequently the chief difference between the two kinds of business is that to make a profit the manufacturing company has to pay the fixed factory costs in addition to the selling salaries, administration costs, storage, etc. Furthermore, the fixed factory costs are like the occupancy costs (rent, maintenance, etc.) of a retail store. On such a basis the factory's "direct costs," i.e., variable costs, are similar to the retail store's "cost of purchases."

The controller argued that a further advantage of his proposal would be the provision of a more satisfactory basis for making the usual monthly comparison of margin figures in the company's product-by-product gross margin statement. When recast in the new form (with fixed costs excluded), the figures would be much more meaningful. The new margin figures would be much higher all down the line, but once the management adjusted its thinking to the new basis, the controller was confident that the value of knowing how much each product was contributing to fixed costs and profit would be greatly appreciated.

One of the sales executives supported the controller's argument on the usefulness of the new margin figures. He pointed out that if there were two products sold by one of his divisions, Products A and B, and if the situation were as described in the following example, Product B would clearly *appear to be* the more desirable item to sell:

Product	Total Factory Cost per Pound (Std.)	Selling Price	Margin	Percentage of Sales
A..........	$0.897	$1.55	$0.653	42.1
B..........	1.015	1.80	0.785	43.6

If, however, the new margin figures were to work out something as follows, then Product A was by all odds the product on which the company's selling effort really should be concentrated:

Product	Variable Factory Cost	Selling Price	New "Margin"	Percentage of Sales
A..........	$0.413	$1.55	$1.137	73.6
B..........	0.809	1.80	0.991	55.6

The controller's proposed method of keeping records, the sales executive reasoned, would thus reveal the true opportunities for profit. He cited one company he knew that had adopted a system similar to that proposed by the controller and had so redirected its selling effort that in less than eight months it had shifted from an operating loss to an operating profit and had maintained good profits ever since.

At this point in the discussion the treasurer entered the argument. He observed, cynically, that the first thing anyone knew, the sales department, in its efforts to get business, would be selling at its usual markup over the new standard cost figures (variable costs only). "When that time comes," he snorted, "how are we going to cover the fixed costs? Where do we get our capital replacements? We'll have to pay the piper sooner or later."

Turning to the controller, who had talked of the desired focus of the new system on variable costs, the treasurer gave as his opinion, based on long experience, that it was the lack of control of the long-run costs that really wrecked a company. "You can make mistakes on the direct costs," he said, "but because things in this area are constantly changing and because one never makes much of a commitment anyway, the life of the company is really not seriously hurt. If necessary, a new management could quickly reverse the trend. But once a company lets the long-run costs get out of control, then the fat really is in the fire. I'm opposed to anything that leads us to take a shortsighted view of cost." To this argument the controller had little to say, except that it was a matter of emphasis, and that he still thought the variable costs the more important.[4]

All of the group discussing the proposal were aware of the effect of the controller's scheme on the inventory item in the balance sheet. The treasurer, and the president too, were worried about this effect, and both wondered if the possible improvement to the operating statement was worth the price of distorting the balance sheet. The controller proposed that a footnote be carried in the balance sheet calling attention to the matter, and perhaps indicating the extent of the distortion.

When one of the officials asked about the income tax implications, the controller pointed out that the tax return was a special report, that it already differed from the company's operating reports in several respects, and that the reports he was suggesting were monthly profit estimates largely for internal use and not annual reports. Furthermore, if the company wished to do so, the annual reports could be computed on the more orthodox basis. "But," he insisted, "let's make these monthly reports so that they help us, not handicap us."

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[4] Variable costs were 67 per cent of total costs in 1954.

Balance sheets for the company are shown in Exhibit 3, together with an indication of how the balance sheet figures would appear had the company used the "direct cost" method. Income statements for September, under both the present and proposed methods, are shown in Exhibit 4. In Exhibit 4, nomenclature and arrangement has been changed somewhat in order to facilitate comparison between the present and proposed systems.

Exhibit 3

BEALE COMPANY

Condensed Balance Sheets as Actually Prepared

	As of September 30, 1955	*As of October 31, 1955*
ASSETS		
Current Assets:		
Cash	$ 80,560	$ 95,553
Accounts receivable	150,428	178,610
Inventory	573,630	521,822
Total Current Assets	$ 804,618	$ 795,985
Plant and equipment (net)	2,120,450	2,108,788
Total Assets	$2,925,068	$2,904,773
LIABILITIES AND NET WORTH		
Current liabilities	$ 397,480	$ 382,200
Mortgage payable	560,000	560,000
Total Liabilities	$ 957,480	$ 942,200
Net Worth:		
Capital stock	1,000,000	1,000,000
Retained earnings	967,588	962,573
Total Net Worth	$1,967,588	$1,962,573
Total Liabilities and Net Worth	$2,925,068	$2,904,773

EFFECT OF "DIRECT COST" METHOD

Had the Beale Company used the direct cost method, its balance sheets would appear as above except for the Inventory and Retained earnings items. These would appear as shown below:

	As of September 30, 1955	*As of October 31, 1955*
Inventory	$401,541	$365,776
Retained earnings	795,499	806,527

Note: In both present and proposed statements, the effect of income taxes is not shown. The Beale Company recorded estimated income tax expense only at the end of the calendar year.

Exhibit 4

BEALE COMPANY

Condensed Income Statement, Month of September, 1955

	As Actually Prepared	*Under Proposed Method*
Sales	$283,028	$283,028
Cost of sales at standard	152,604	104,662
Gross Margin	$130,424	$178,366
Less: Manufacturing variances:		
Labor	5,426*	5,426*
Material	5,081	5,081
Overhead:		
Volume	447*	......
Spending	2,173	2,173
Fixed factory overhead	......	65,862
Subtotal Overhead and Variances	$ 1,381	$ 67,690
Profit before administrative and selling expenses	$129,043	$110,676
Selling Expenses (Total)	$ 85,482	$ 85,482
Administrative Expenses (Total)	26,026	26,026
Total Administrative and Selling Expenses	$111,508	$111,508
Operating profit	$ 17,535	($ 832)
Other income or charges	14,026	14,026
Net Profit or (Loss) Current Month	$ 3,509	($ 14,858)

* Credit variance.

Questions

1. What do you recommend?

2. Approximately how busy (relative to normal volume) was the factory in October?

3. Could the problem in the case ever arise with respect to annual statements of profit?

Chapter

14

CONTROL: GENERAL CONSIDERATIONS

In the remaining chapters of this book, we shall consider the two areas of planning and control. Planning is the process used by management for deciding what it wants the organization to do, and control is the process of assuring that the organization does what management wants done. These two processes are closely connected and merge into one another since the control process comprises steps taken to carry out decisions reached in the planning process, and planning requires the use of information obtained from the control mechanism. Timewise, planning occurs first, but in this book the control process is taken up ahead of planning, since many of the techniques common to both areas are best introduced by considering their application to control problems.

We shall be primarily concerned with the use of quantitative information, particularly accounting information, in the control process. In this connection, however, a point made in Chapter 1 should be re-emphasized: quantitative information is never the sole means by which an organization is controlled, and often it is a relatively unimportant means. Standard costs, variances, performance reports, and other control tools and techniques are relatively easy to describe and to comprehend, but in practical situations these formal tools are by no means a substitute for face-to-face informal conversations between one person and another, the creation and maintenance of a good "control atmosphere," and similar intangible but crucially important factors.

Subject to the above limitation, it is possible to say that accounting information can be useful in three ways in the control process:

1. As a means of *communicating* information on what management wants done;
2. As a means of *motivating* the organization to act in ways most likely to further the basic objectives of the business;
3. As a means of *appraising performance,* that is, of deciding how well the organization performed.

COMMUNICATION

Management must do the planning for the business, but the plans will not be carried out unless the organization understands what management wants done. The plans which the organization must understand include not only positive programs and objectives (e.g., how many units are to be manufactured, what methods and machines will be used, how much material is to be purchased, the prices at which products are to be sold) but also policies, limitations, and restrictions to which the organization should adhere in carrying out these objectives. Examples of these limitations are: the maximum amounts that are to be spent for certain items such as advertising, maintenance, administrative costs, and so on; the number of men who are to be employed and their wage rates; and the quality and quantity of material that is to be used. To the extent that these objectives and limitations are communicated through dollar information, the most commonly used device for doing so is the approved budget. Since the budget is also a device for planning, a discussion of it will be deferred to Chapter 16.

MOTIVATION

An obvious, but fundamental, fact about organizations is that they are made up of human beings. The control process essentially consists of inducing the people in an organization to do certain things and to refrain from doing others. For some purposes, it is useful to accumulate the costs of manufacturing each type of product, but management literally cannot "control" a product, or the costs of making a product. What management does—or at least what it attempts to do—is to control the actions of the people who are responsible for incurring these costs.

Responsibility Centers

Since costs can be controlled only by the people who are responsible for incurring them, an essential concept of control is that of the *responsibility center.* This is a unit headed by an individual who is responsible for earning revenue or for incurring certain elements of cost. In a single business, there is a whole hierarchy of responsibility centers. At the top, there is the president, or chief executive officer, who may be held responsible by the owners for the over-all profitability of the enterprise. At a lower organizational level, the several operating and staff departments may each be responsibility centers, and at still lower levels, responsibility centers may consist of sections, subsections, or even, in some cases, individuals who have no one else reporting to them.

In the ideal control system, each responsibility center is charged only for those revenue and cost items for which its head is held responsible. As a practical matter, however, this usually cannot be achieved. Only in rare cases does one individual have complete control over *all* the factors that influence a given cost element. The foreman of a manufacturing department, for example, presumably has some degree of responsibility for the direct labor costs incurred in his department, but his influence over labor costs may actually be quite limited since wage rates may be established by the personnel department or by union negotiations; the amount of labor required for a unit of product may be largely determined by the engineers who designed the product and who specified how it was to be manufactured; and the number of units produced, and hence total labor costs, may be influenced by the output of some other department, by the ability of the purchasing department to obtain materials, or by a variety of other factors.

Nevertheless, the foreman usually has a significant influence on the amount of direct labor cost incurred. He has some control over the amount of idle time in his department, the speed and efficiency with which work is done, and other factors which to some extent affect labor costs. Although the head of a responsibility center may never have *sole* responsibility for any element of cost, if he has a *significant influence* on the amount of costs incurred, such elements are properly considered "controllable" and therefore are chargeable to his responsibility center.

One useful way of distinguishing between those parts of a cost element for which a person is responsible and those for which he is not is to use a standard cost. A standard labor cost, for example, presumably states what the cost should be, considering the influence of wage rates, product design, and other factors over which the foreman has no control. Ideally, the difference between standard cost and actual cost represents the effect of actions by the foreman, and it is this difference, or variance, for which the foreman is held responsible. As will be explained in a subsequent section, there are many reasons why this concept does not work out perfectly in practice, but it nevertheless may work well enough to provide an acceptable basis for control.

In addition to cost elements which he can influence directly, the head of a responsibility center may also be charged with other costs. These are costs which management wishes him to be concerned about, the expectation being that his concern may indirectly lead to better cost control. For example, an operating unit may be charged with part of the costs of the personnel department, even though the foreman of the unit has no direct responsibility for that department. Such a charge can be justified either on the grounds that the foreman will be careful about making unnecessary requests of the personnel department if he is made to feel some responsibility for personnel department costs or on the grounds that the foreman may in various ways influence the head of the personnel department to exercise good cost control in his own department.

Some companies follow the practice of charging general overhead costs to responsibility centers, even though it is recognized that the supervisor cannot exercise control over these costs. A reason given in support of this practice is that it shows the supervisor the magnitude of the indirect costs that are incurred to support his unit. In some cases, such a practice may boomerang, for the responsible supervisor may conclude that his controllable costs are so small, relative to the overhead costs that he cannot control, that they are not worth worrying about. In any event, when noncontrollable costs are charged to responsibility centers, it is important that they be clearly differentiated from the costs that the supervisor is expected to control.

The responsibility center concept is relatively new, and a great many companies, probably a majority, still make no attempt to structure their accounting system in terms of personal responsibility. The idea of the "cost center" is, however, relatively old, and the same organization units that traditionally have been called cost centers often conform to the definition of a responsibility center.

A cost center is a device for collecting the costs that are to be charged to products passing through the center. As it happens, the operating departments in a business are often regarded as cost centers, and since the departmental foreman is often the lowest level of supervision—i.e., the "first-line" supervisor—such departments are also likely to be responsibility centers.

The costs charged to a department for product costing purposes, however, are unlikely to be the same as the costs used in measuring responsibility. For product costing, it is appropriate to charge to the cost center both the costs actually incurred in the department and a fair share of depreciation, general overhead, administrative costs, and other costs incurred outside the department. For control purposes, these prorated and allocated costs are not relevant since the foreman cannot influence them. Thus for control purposes, attention is focused on the controllable elements of cost in each responsibility center, and noncontrollable elements are either disregarded or, if charged to the responsibility center for the purpose of calling them to the supervisor's attention, are given much less emphasis than the controllable items. Incidentally, the term "controllable cost" means controllable by a given responsibility center; *all* costs are controllable by someone.

Charging Costs to Responsibility Centers

The actions of people can be considerably influenced by the manner in which controllable costs are charged to responsibility centers. As an illustration of this point, let us consider the problem of the control of maintenance costs in a factory that has a separate maintenance department. The maintenance function is that of keeping the buildings and equipment in good operating condition. This is partly the responsibility of the maintenance department, which incurs costs when it makes repairs or does other maintenance work; it is partly the responsibility of the operating department foremen who can influence the amount of required maintenance work by the care they give to their equipment; and it is partly no one's responsibility in that some maintenance work, such as painting, is required simply because of the passage of time and the forces of nature.

There are at least a dozen ways in which the costs of the maintenance department can be charged to the several operating departments, and each gives a different "message" to the foremen as to how they should view their responsibility for maintenance. Here are a few of the possibilities and the implications that are likely to be conveyed by each:

Method No. 1: Do not charge any maintenance costs to the operating departments.

Message: The operating foreman has no responsibility for maintenance costs.

He requests the maintenance department to do the work that he thinks should be done, and the maintenance department has the responsibility for doing it. The maintenance department is implicitly responsible for the condition of the equipment. (Note that this system does not motivate the foreman to curb unnecessary requests for maintenance work.)

Method No. 2: Prorate total maintenance costs to the operating departments on the basis of the number of direct labor hours incurred in each.

Message: Maintenance costs in total are expected to vary proportionately with plant activity. However, the foreman of each department has no direct responsibility for maintenance work, and the maintenance department, as in the first method, has full responsibility. The operating foreman is told what is his "fair share" of total maintenance costs incurred.

Method No. 3: Charge departments for each job they have done at a prescribed amount for each type of job.

Message: The foreman is responsible for situations that create the need for maintenance work, such as machine breakdowns. The maintenance department is responsible for the cost of doing a given maintenance job. The foreman therefore need not be concerned with the efficiency with which maintenance men work, once he has requested that the job be done, since he will be charged a prescribed amount no matter how much is actually spent in doing the job.

Method No. 4: Charge each department for maintenance work at a prescribed hourly rate for each hour that a maintenance man works in the department.

Message: The foreman is responsible both for situations that create the need for maintenance work and for the time taken by the maintenance people to do the work. Presumably, he has some control over the work of the maintenance men. He may, in some situations, even be authorized to hire outside maintenance people if he believes that they will do the work less expensively than the rates charged by the maintenance department.

None of the above methods is necessarily better than the others. Each of them tends to motivate the foreman differently. The best method is that one which motivates the foreman to act most nearly as management wants him to act. Depending on what management wishes to accomplish, any one of these methods, or other methods not listed, or some combination of them, may be best for a given company. The difficult problem is to decide what direction the motivation should take and then to select a method that influences the foremen to act in this manner.

It should be apparent from the above that the choice of the best cost system for control purposes depends largely on psychological considerations. These considerations have no necessary relation to generally accepted accounting principles or to any of the concepts that were described in connection with the problem of collecting costs for inventory and cost-of-sales purposes.

Internal Auditing and Control

Although this topic is largely outside the scope of this book, brief mention will be made of the necessity for internal auditing and control devices since such devices can motivate people to safeguard the assets of the business and to make sure that records are accurately compiled. The management of any organization has a responsibility for surrounding the spending of money with some safeguards in order to minimize the possibilities of theft and waste. Management has a *stewardship* relationship to the stockholders or others who supply the funds used by the organization. This is a legal, as well as a moral, responsibility; the directors of a corporation can be sued by the stockholders if they do not see to it that adequate safeguards are erected and maintained.

Usually, a control system does not insure the absolute *prevention* of theft or waste, for in most situations such a system would be so elaborate that it would cost more than the loss which it seeks to prevent and would unduly restrict the efficient performance of the organization. The proper balance between adequate protection, on the one hand, and minimum cost and bother, on the other, is difficult to achieve; a control system that is too tight is as harmful as a system that is too loose. Beyond a certain point, an increase in the number and complexity of safeguards may actually result in less, rather than more, control over theft and waste. For example, the Hoover Commission concluded that the U.S. General Accounting Office's former practice of making a detailed audit of every piece of paper handled by a government agency was probably a less effective safeguard than the practice of business auditors who make a much more general examination.

Management Attitude

The control techniques mentioned above are intended to help motivate people, but they do not, by themselves, provide the motivation. The techniques will be completely ineffective unless management demonstrates, by its expressed interest in the system and by its action, that it considers the control of costs charged to responsibility centers as being important. If responsible supervisors get the impression that management is not paying attention to the figures, then the control system can quickly degenerate into a paper shuffling routine whose principal virtue is that it provides employment for a great many clerks.

APPRAISAL OF PERFORMANCE

Control devices are usually thought of as providing a means of appraising a person's performance—of indicating whether or not he has done a good job—and this is indeed one of their important functions. The appraisal of performance involves a paradox, however. A man's performance can be measured only *after* he has performed, but at that time the work has already been done, and nothing management does later can change what was done. Of what value, therefore, are techniques for judging performance? There seem to be two valid answers to this question. First, if a person knows in advance that his performance is going to be judged, he tends to act differently than if he believes no one is going to check up on him. (Anyone who receives grades in school should appreciate the importance of this point.) Secondly, even though it is literally impossible to change an event that has already happened, an appraisal of how well a person has performed in the past may indicate ways of obtaining better performance in the future. The possible courses of action resulting from such an appraisal range from the extremes of firing or promoting the person, to such things as giving criticism or praise or suggesting specific means of improving future performance.

The Search for a Standard

The method of judging performance is easy to state but difficult to apply in practice. The task is, essentially, to compare what a person *actually did* with what he *should have done* under the circumstances. In many cases, actual performance can be ascertained without difficulty. The trick is to find a *standard,* or basis of comparison, that states what performance should have been under the conditions existing at the time.

The task of judging performance in business is complicated because results are affected by a complex set of factors, and the net influence of all these factors is never identical at two different times or on two different jobs done at the same time. Going back to the example of the athlete, for contrast, one can state with a great deal of confidence that a man who runs the mile in 4:04 minutes has done an excellent job. It may be desirable to take into account the circumstances surrounding the race, such as whether it was indoors or outdoors, the condition of the track, and the type of race run by competitors, but there are only a few such circumstances, and their influence can be judged without much difficulty.

But what can we say about a foreman in whose department indirect labor for a week was $404? First of all, we are not even sure of the *direction* that represents good performance. Offhand, one might conclude that spending $404 is "better" than spending $504, but there are many situations in which such a conclusion would be incorrect. If the foreman had spent another $100, for example, the department might have been able to turn out a much larger quantity of products, or the quality of the products might have been better, or safety conditions might have been improved, or other results much more valuable than $100 might have been achieved. Secondly, the actual spending of $404 may have been occasioned by any of a large number of factors over which the foreman has no control—company policies, an accident, orders from a superior, and a long list of others. Unless these factors are recognized and their impact measured, we cannot get an exact measure of the thing we are trying to measure: the performance of the foreman himself.

Despite these difficulties, judgments about performance must be made, and the process involves searching for some kind of standard, imperfect though it may be, as a guide in making such judgments. Several possible types of standards have been mentioned in Chapter 13 in connection with the specific problem of analyzing financial statements. They are repeated in more general terms below.

1. ***Predetermined Standards or Budgets.*** These are statements of expected performance under an assumed set of circumstances, and although actual events will never exactly match the assumed conditions, the standard may nevertheless be an adequate approximation to what the man should have done. The use of such standards is discussed in more detail in Chapter 15.

2. ***Performance of Others in Comparable Jobs.*** Department A may be compared with Department B, and if conditions in the two departments are reasonably similar, the comparison may provide a useful basis for judging performance.

3. ***Performance in the Past.*** Results this month may be compared with results last month, or to results in the same month a year ago, for example. In addition to the need to allow for the circumstances that may have changed between the two periods, this comparison has the difficulty that when a man is measured against his own record, there may be no way of knowing whether the prior period's performance was acceptable to start with. A foreman whose spoilage cost is $100 per

week for a number of weeks is consistent, but we do not know, without other evidence, whether he is consistently good or consistently poor. A judgment based on comparisons with the past is therefore properly expressed in comparative terms ("better" or "worse"), and it is somewhat less satisfactory than an absolute statement ("good" or "poor") which can often be made on the basis of other types of standards.

Necessity for the Supervisor's Concurrence

Whatever the standard that is adopted, it is likely to be effective as a means of control, only if the person being judged agrees that it is a fair standard. If he does not agree that it is equitable, he is likely to pay no attention to comparisons between his performance and the standard; and he is likely to resent, and if possible reject, an attempt by anyone else to make such a comparison.

Perhaps the best way to assure this agreement is to ask the person whose performance is to be measured to participate in the process of setting the standard. This was not the usual practice some years ago when the practice of budgeting was getting started. The earliest budgets were "imposed budgets"; that is, they were edicts promulgated by management which said, in effect, to the organization: "Thou shalt do such and such." The results obtained from these imposed budgets were frequently unsatisfactory because the organization tended to resent them.

The more recent trend is in the direction of permitting the person who is being held responsible for performance to have a considerable voice in the preparation of the budget. This trend is a manifestation of the general tendency to decentralize decision making to lower echelons in the organization.

Although the responsible supervisor participates in the budgeting process, this does not mean that he is solely responsible for deciding what the budget allowances are to be. Rather, the supervisor and his superior discuss the matter until they *jointly* agree on a budget.

Management by Exception

The use of a formal standard as a basis for comparison makes possible the practice of "management by exception." A control system operated on the exception principle is one in which management's attention is focused on the relatively small number of items in which actual performance is significantly different from the standard, so that little or no attention need be given to the relatively large number of situations where performance has been satisfactory. No control system makes a *perfect* distinction between the situations which warrant management attention and those which do not. For example, it is the usual practice to "red flag" those items for which actual spending significantly *exceeds* the budgeted amount, but an investigation of these items may reveal that a difference between actual and budgeted spending was entirely warranted. On the other hand, actual spending for some items may exactly match the budget allowance, but an unsatisfactory situation may nevertheless exist. The "exception principle" is thus tricky to apply in practice. It is nevertheless a useful starting point for grasping the significance of what would otherwise be a bewildering mass of data, provided that the need for some examination of the superficially unexceptional situations is not overlooked. Conforming precisely to the budget is not necessarily good, and departing from the budget is not necessarily bad.

Attacking an Appraisal Problem

The cases accompanying this chapter raise the problem of attempting to judge performance on the basis of some sort of standard. A characteristic of all these cases is that they contain less information than ideally would be desired in reaching a judgment. This, however, is a characteristic of similar problems in real life; rarely is it possible to obtain as much information as one would like. Everyone would agree that mistakes were made at Gettysburg, but despite volumes of analysis by military experts and historians, there is not unanimous agreement, even today, as to what these mistakes were or who was responsible for them. Nevertheless, the field commanders at the time, without the benefit of any historical research, had to make judgments on the performance of those participating in this battle and to take action on the basis of these judgments.

In view of the inevitable incompleteness of the data, the following may suggest a useful way of attacking a problem that involves the appraisal of performance:

1. From the information available or obtainable, decide on the best possible standard or basis of comparison.
2. Define the factors that are not included in the standard, attempt to estimate the importance of these factors, and either modify the standard to take them into account or reduce the degree of certainty attached to the comparison of actual against standard.
3. Find and attempt to estimate the importance of nonquantitative considerations that cannot be included in a standard (e.g., morale, quality, intangible future benefits).
4. Make a judgment and be prepared to act on it. (One possible

judgment is that you will not act until you have acquired more information. This judgment should be made only if you are reasonably confident that it is both feasible and necessary to obtain additional facts.)

Control and the Controller

Although not strictly relevant to the subject of this chapter, it seems desirable to call attention to the natural, but erroneous, tendency to believe that the controller is the person who is primarily responsible for exercising control. Such an inference is natural because of the similarity between the two words. Generally, the controller is responsible for the design and operation of the *system* by means of which control figures are collected and reported, but the *use* of these figures in actual control is the responsibility of line management. The controller is something more than an accountant and something less than a chief executive. In addition to his accounting job of collecting historical figures, the controller may also be responsible for analyzing figures, for pointing out their significance to management, and for making recommendations as to what should be done. Moreover, he may police the adherence to limitations on spending laid down by the chief executive. In recent years the controllership function has become increasingly important in companies generally. The controller does *not,* however (unless *de facto* he *is* the chief executive) make or enforce management decisions. The responsibility for control runs from the president down through the line organization, not from the controller, who is a staff officer.

CASES

CASE 14–1. GILLETTE SAFETY RAZOR COMPANY

On the morning of March 5, Miss Ruth Fillipetti, an employee of the Gillette Safety Razor Company, reported for work in the buffing room of the South Boston plant. At the stock cage she picked up a tray containing handles for one of the current models of the Gillette Safety Razor. These stamped copper handles had been sent to the Buffing Department for smoothing and polishing. After being polished, the handles went to the Plating Department for the final stage in their manufacture.

Miss Fillipetti's job was to smooth and polish the end of the razor handle. In this work Miss Fillipetti used a power-driven buffer wheel, against which she held the handle. The operation was not a difficult one, but it was not automatic; that is, Miss Fillipetti was required to place the end of the handle against the buffer wheel manually. For certain

Exhibit 1

GILLETTE SAFETY RAZOR COMPANY

Daily Report of Production by Operators

GILLETTE SAFETY RAZOR COMPANY
DAILY REPORT OF PRODUCTION BY OPERATORS

DATE March 5

490 BUFFING DEPARTMENT

Total Expected Hours	180$^{\underline{9}}$
" Productive Hours Not Measured	48$^{\underline{6}}$
Lost Hours	13$^{\underline{3}}$
Gained Hours	5
Nonproductive Hours Charged to This Dept.	50$^{\underline{4}}$
" " Not Charged to This Dept.	2
Loaned Hours	48
Total Actual Hours Worked incl. Loaned	343$^{\underline{10}}$

				Production		Hours		Diff. Red-Loss Bl.-Gain				Production		Hours		Diff. Red-Loss Bl.-Gain	
		Operation Number	Acct.	Total Actual	Expected per Hour	Expected	Actual	R	B	Operation Number	Acct.	Total Actual	Expected per Hour	Expected	Actual	R	B
4126	MOORE, STELLA	195 D 20	502	2800	375	7 $\underline{6}$	8	$\underline{6}$									
4126	MOORE, STELLA																
4127	MACCAREY, ELEANOR	1001 DG 25	502	2800	-		7										
4127	MACCAREY, ELEANOR	195 DG 25	502	400	400	1	1										
4128	MURPHY, ELLEN	1005 R 200	502	200			1 $\underline{9}$			195 D 20	502	450	375	1 $\underline{2}$	1 $\underline{6}$	$\underline{4}$	
4128	MURPHY, ELLEN	1005 RG 26	502	100			$\underline{6}$			194 H 20	522	600	300	2	3 $\underline{3}$	1 $\underline{3}$	
4129	LEIGH, VIRGINIA	139 B 204	502	20000	2250	8 $\underline{11}$	8		$\underline{11}$								
4129	LEIGH, VIRGINIA																
4130	FILLIPETTI, RUTH	195 D 20	502	2100	375	5 $\underline{7}$	7 $\underline{10}$	2$^{\underline{3}}$									
4130	FILLIPETTI, RUTH																
4131	LURRELLO, HELEN	139 B 24	502	14000	1750	8	8										
4131	LURRELLO, HELEN																

4132	CONRAD, HORTENSE	Loaned						8														
4132	CONRAD, HORTENSE																					
4133	O'LEARY, KATHARINE	1005 AG 210	502	76					$\underline{3}$													
4133	O'LEARY, KATHARINE	195 D 20	502	2275	375	6	$\underline{1}$	7	$\underline{9}$	$1^{\underline{8}}$												
4134	WOODROW, ESTHER	139 B 206	502	20000	2250	8	$\underline{11}$	8			$\underline{11}$											
4134	WOODROW, ESTHER																					
4135	ROVETA, MILDRED	195 C 24	502	12000	1750	6	$\underline{10}$	8		$1^{\underline{2}}$												
4135	ROVETA, MILDRED																					
4136	CAPRA, JOSEPHINE	1004 A 20	522	500				3	$\underline{5}$													
4136	CAPRA, JOSEPHINE	195 D 20	502	1600	375	4	$\underline{3}$	4	$\underline{7}$	$\underline{4}$												
4137	CASSIDY, ELINOR	195 D 20	502	2400	375	6	$\underline{5}$	8		$1^{\underline{7}}$												
4137	CASSIDY, ELINOR																					
4138	LOVITT, MARION	Group																				
4138	LOVITT, MARION																					
4139	LESLIE, ALTHEA	1004 A 20	522	1100				8														
4139	LESLIE, ALTHEA																					
4140	SMITH, MARY	139 B 29	502	14000	1750	8		8														
4140	SMITH, MARY																					
4141	GRADY, ANNE	Loaned																				
4141	GRADY, ANNE																					
4142	LAMB, ELIZABETH	1001 D 211	502	23000	3500	6	$\underline{7}$	8		$1^{\underline{5}}$												
4142	LAMB, ELIZABETH																					

models, an automatic machine could be used which required only that the handles be placed on a moving belt of spindles. This belt carried the handles automatically across a buffer wheel. Miss Fillipetti spent the full day of March 5 buffing razor handle ends and by 5 o'clock had completed the smoothing and polishing of 2,100 pieces.

A close check was kept on the amount of work given to Miss Fillipetti and also on the amount of time she spent doing it. Although none of the employees of the Gillette Safety Razor Company was paid on a piece-rate basis, a daily comparison was made of the actual and standard times required to do the work assigned. On the morning of March 6 the time card for Miss Fillipetti, together with time cards of other employees in the buffing room, was sent upstairs to the Accounting Department, where work and time requirements were posted and compared with previously established standard times. By 4 o'clock that afternoon—that is, the afternoon of March 6—the complete record of gains and losses with reference to standard times for work done on March 5 was reported back to the foreman in the buffing room. A procedure similar to that used for the Buffing Department was followed for each of the production departments of the razor division. In some departments the reports were referred to by the foremen when talking privately with operators, but in other departments the reports were posted daily. A portion of the March 5 report for the Buffing Department is reproduced as Exhibit 1.

The time standard set up for the operation of buffing the ends of the razor handles was 375 handles per hour.[1] The normal time to produce 2,100 units at the rate of 375 per hour was 5 hours and 36 minutes. The time records were kept in 5-minute units; and, therefore, the expected time for the work done by Miss Fillipetti on March 5 was listed on the report as $5\frac{7}{12}$ hours. Her day's work actually took $7\frac{10}{12}$ hours so that a loss of $2\frac{3}{12}$ hours in standard time was indicated. When actual time exceeded standard allowable time, the amount lost was reported on the daily record sheet in red pencil; when actual time was under standard time, the gain was shown in black. A summary for the whole department was shown at the top of each report form.

Once a week the daily summary reports were combined into a weekly report which was furnished each of the foremen and the plant superintendent. From these weekly reports a continuous tabulation was maintained by the plant superintendent. The departmental labor control record for the buffing room shown in Exhibit 2 contains data for the three-month period beginning with the week ending December 23, through and including the week ending March 16.

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[1] This operation was coded as 195 D 20; the "195" refers to the model; the "D" to the handle of the razor; and the "20" to the operation. A similar code number was given every other operation. The letter "B" was used to refer to the cap of the razor; "C" to the guard; and "A" to the complete razor. The operation on which Miss Fillipetti was engaged, 195 D 20, was known as "cut down and color."

The first column of the departmental labor control record (Exhibit 2) gives the normal or standard allowable hours for the volume of work done. Normal hours were the daily average of the "expected" hours shown on the daily report. Columns 2 and 3 of Exhibit 2 show the average daily hours lost and gained. Column 4 gives the daily average of actual hours required to do the same work for which the normal operating time is given in column 1. It will be noted that column 1 plus column 2 minus column 3 equals column 4. The entries in column 5, "General Ledger," refer to hours spent on special work ordered by the general office and therefore not part of the normal production flow. Column 6 gives the number of hours' work which was not measured and for which no normal times were available for comparison. Columns

Exhibit 2

GILLETTE SAFETY RAZOR COMPANY

Departmental Labor Control, Department 490—Buffing
Average Daily Hours

Week Ending	Normal Hours (1)	Hours Lost (2)	Hours Gained (3)	Actual Measured Hours (4)	General Ledger (5)	Productive Hours Not Measured (6)	Non-productive		Total Hours (9)
							Hours (7)	Ratio to Normal Hours (8)	
December 9...	212.9	8.0	8.1	212.8	6.4	30.1	50.8	23.86	300.1
16...	183.8	10.5	5.6	188.7	12.7	23.4	51.3	27.91	276.1
23...	192.0	5.5	5.2	192.3	11.9	22.7	51.4	26.77	278.3
January 6...	174.7	9.2	5.0	178.9	2.0	39.8	57.6	32.97	278.3
13...	196.4	24.4	4.9	215.9	1.5	28.2	54.2	27.60	299.8
20...	194.9	14.6	6.1	203.4	4.0	54.5	50.3	25.80	312.2
27...	194.7	11.3	7.5	198.5	8.0	63.0	54.8	28.15	324.3
February 3...	160.8	10.5	4.5	166.8	6.0	106.9	56.7	35.26	336.4
10...	153.8	14.5	3.4	164.9	5.8	86.1	41.7	27.11	298.5
17...	168.4	19.7	5.4	182.7	3.6	72.7	50.9	30.23	309.9
24...	177.1	13.2	3.7	186.6	2.5	72.7	57.5	32.47	319.3
March 2...	192.5	10.6	3.5	199.6	1.8	68.3	54.8	28.47	324.5
9...	201.1	13.2	3.2	211.1	0.4	46.7	54.1	26.90	312.3
16...	169.6	5.4	4.8	170.2	...	17.7	56.3	33.20	244.2

7 and 8 relate to nonproductive time devoted to the work of maintenance and similar work not directly resulting in produced goods. The final column gives the total number of hours worked in the department.

A report similar to that shown in Exhibit 2 was prepared weekly for each of the departments engaged in manufacturing razors. Exhibit 3 shows for the weeks ending March 9 and March 16 the hours lost in each of six departments. The exhibit also shows the total number of hours reported for the departments and the number of measured hours for which losses were computed.

Exhibit 3

GILLETTE SAFETY RAZOR COMPANY

Excerpts from Production Control Report, Selected Departments

Average Daily Hours

Department	Hours Lost		Measured Hours		Total Hours	
	Week Ending March 9	Week Ending March 16	Week Ending March 9	Week Ending March 16	Week Ending March 9	Week Ending March 16
Cap and Guard........	0.3	0.7	167.9	208.5	297.2	279.2
Buffing...............	13.2	5.4	211.1	170.2	312.3	244.2
Handle Inspection.....	6.0	2.8	143.2	135.7	157.4	146.2
Wire and Plating......	0.1	...	79.3	86.3	181.7	188.1
Handle Packing.......	34.5	50.9	440.2	546.5	535.9	683.4
Auto-Strop and Probak Department.........	13.2	7.9	64.4	60.4	186.4	156.1

The daily report comparing actual and normal times by operators was prepared for the department foremen. The Personnel Department did not receive copies of the daily report and, therefore, could not make the operator's performance a formal part of his personnel record. It was estimated that the time of two clerks was required to prepare the daily and weekly reports for the entire razor division.

Questions

1. What is the source, so far as you can judge, of the entries in each of the columns of Exhibit 1? If you were handed this report, what would you look for first? Should the plant superintendent request that the daily production report be put on his desk?

2. If Miss Fillipetti's record on operation 195 D 20 continued to be poor, should the matter be referred to the personnel department? Before taking such action, what should the department manager consider?

3. Rank, from best to poorest, the performance of Stella Moore, Ellen Murphy, Ruth Fillipetti, and Esther Woodrow.

4. What purpose could be served by the operating report illustrated in Exhibit 1? Is it worth the cost? Should the cost be shared by other reports, perhaps not shown in the case?

5. What is Exhibit 2? Why is this type of report called a comparative report? Why are the figures in Exhibit 2 in terms of daily averages instead of weekly totals?

6. Look at Exhibit 2, *not Exhibit 3,* and decide what items you would select to be included in a summary report comparing performance in various departments in the factory.

7. What do Exhibits 2 and 3 tell other than the number of hours put in by employees? Doesn't management really want to know whether any work was done during those hours?

8. If you were receiving these control reports, what standards would you develop?

CASE 14–2. CANTON COMPANY

The Canton Company, a manufacturer of office supplies, sold to wholesalers and retailers. The company desired to establish standards by which the efficiency of the packers in the shipping room could be judged each week. If the standards proved satisfactory, the company expected to put packing on a piecework basis.

The company carried about 5,000 items in its warehouse. Items ordered were picked from the warehouse shelves, assembled in metal containers, and sent by gravity conveyors to the shipping room. There the goods were transferred to another gravity conveyor which ran between two lines of packers. Each packer was located next to a side track leading off from the main conveyor. The space occupied by a packer was called a "pocket." There were six pockets on one side of the conveyor and four pockets on the other side, as shown in Exhibit 1. The manager rotated the men from pocket to pocket so that a man occupied each pocket one week and usually did not occupy the same pocket again until he had occupied every other pocket. The men usually occupied the pockets in the following order: 6, 5, 4, 3, 2, 1, 7, 8, 9, 10.

As the metal containers of merchandise to be packed came slowly down the conveyor, the packers pulled them onto the side tables that formed their pockets. There the merchandise was packed in corrugated cardboard cartons, and shipping labels were affixed. Within limits, the management found it possible to adjust the number of packers to the amount of work to be done. Ordinarily there was work for ten packers; if not, one of the packers would be temporarily withdrawn.

The time-study department worked out a method by which a standard time allowance could be given quickly for packing each shipment.

Exhibit 1

Canton Company

Diagram of Conveyor Used in Packing Room

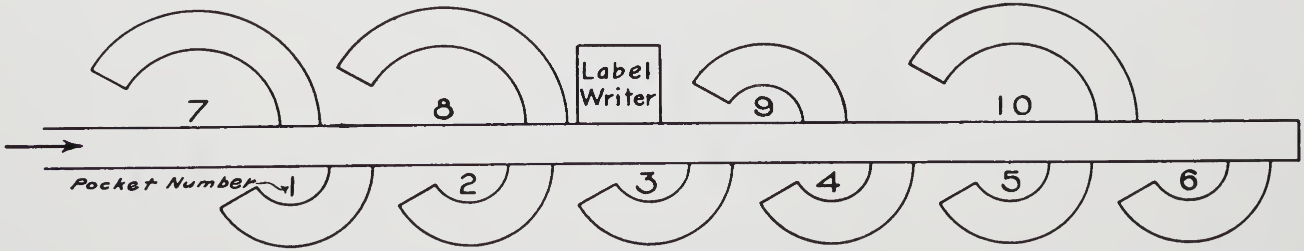

7
8
Label Writer
9
10
Pocket Number
1
2
3
4
5
6

Exhibit 2

CANTON COMPANY

Percentage of Efficiency Attained by Packers in Shipping Room

Week Ending	A		B		C		D		E		F		G	
	Pocket	Percentage	Pocket	Percentage	Pocket	Percentage	Pocket	Percentage	Pocket	Percentage	Pocket	Percentage	Pocket	Percentage
July 5	2	72	6	70	9	69	8	119	5	91	. .	. .	1	80
12	1	70	5	76	. .	. .	9	102	4	83	. .	. .	7	108
19	7	75	4	75	6	67	10	91	3	76	. .	. .	8	79
26	8	63	3	82	5	66	6	74	2	77	. .	. .	9	67
Aug. 2	9	56	2	92	4	74	5	80	1	85	8	95	. .	. .
9	10	68	1	95	3	81	4	96	7	89	9	76	6	46
16	6	57	7	120	2	79	3	103	. .	. .	10	90	5	64
23	5	71	8	81	1	90	2	90	9	63	6	76	4	72
30	4	69	9	65	7	106	1	115	10	74	5	80	3	73
Sept. 6	3	71	10	81	8	68	7	121	6	64	4	88	2	74
13	2	77	6	71	9	75	8	113	5	83	3	98	1	91
20	1	79	5	79	10	66	. .	. .	4	90	2	91	7	94
27	7	86	4	85	6	66	10	90	3	90	1	104	8	61
Oct. 4	8	74	3	93	5	71	6	79	2	84	7	119	9	62
11	9	70	2	99	4	75	5	86	1	101	8	106	10	60
18	10	74	1	122	3	71	4	94	7	110	9	98	6	70
25	6	61	7	115	2	80	3	101	8	92	10	93	5	68
Nov. 1	5	66	8	103	1	86	2	103	9	88	6	85	4	71
8	4	80	9	88	7	107	1	114	10	75	5	90	3	72
15	3	91	10	78	8	86	7	120	6	84	4	104	2	84
22	2	89	6	83	9	73	8	103	5	81	3	103	1	83
29	1	98	5	81	10	68	9	98	4	92	2	96	7	107
Total		1,617		1,934		1,624		2,092		1,772		1,692		1,586
No. of Weeks		22		22		21		21		21		18		21
Average		73.5		87.9		77.2		99.6		84.4		94.0		75.5

This standard time varied according to the number of packages going into each carton and the numbers of cartons per order. This method of assigning standards necessarily was rough, but it was felt that since an average man packed about eighteen cartons per hour, each man would get the same chance at the various types of packing in the course of a week. Before putting into effect a system of piecework based on such standards, however, the company decided to test it by trial. The manager of the packing department kept a record showing, for each man, the percentage of standard time to actual time. He called this the percentage of efficiency. The packers were told that they would be judged according to this percentage of efficiency.

Exhibit 2 summarizes the percentages of efficiency for seven of the packers, called A, B, C, D, E, F, G, by weeks, for a five months' period. The average performance ratings ranged from 73.5 for Packer A to 99.6 for Packer D. The position of the label writer was believed to have no effect upon efficiency in any pocket.

Questions

1. What are the facts of the situation learned from a close examination of Exhibits 1 and 2? Make a list of the various points discovered and note their significance to management.
2. What possible explanations can you find for these facts?
3. What would you do if the responsibility for action were yours?

CASE 14–3. BENTLEY CORPORATION

In the spring of 1948 the management of the Bentley Corporation, manufacturers of corrugated paper, was aware that the company would soon face intense competition. For several years, its mills had been operating at capacity, but demand appeared to be slackening. Consequently, the management started an intensive program to find means of reducing costs.

As one of the first steps in the economy program, the main office cut costs by eliminating unnecessary personnel in the staff departments, dropping unused reports, and tightening controls on administrative expenses. At the same time top management and the various plant managers had conferences on the need for cost reduction at the factory level.

Up to this time the managers of the seven mills that the company operated (scattered throughout the northern part of the United States) were given monthly reports that compared costs of the four different processing departments in each plant. The costs were compiled according to a uniform accounting system. It was recognized that mill costs differed because of size, technology, local cost situations, current volume of output, and so forth. Nevertheless, top management believed that all factors affecting a plant's cost were controllable by someone, either by plant management or by top management.

In an attempt to dramatize the cost differences among mills and the opportunities for cost reductions, the controller's office held several conferences on the subject with plant managers. As a "follow-up" on such discussions, a new report, based on the old comparative cost reports, was prepared and sent to the plant managers. An accompanying letter, signed by the controller, closed with a request for comments or suggestions on the report.

A copy of the new report is shown as Exhibit 1.

Exhibit 1

BENTLEY CORPORATION

Comparative Cost Report, June, 1948

Department 1			Department 2			Department 3		
Mill	Unit Cost	Loss over Best	Mill	Unit Cost	Loss over Best	Mill	Unit Cost	Loss over Best
A	$0.655	$ 0	D	$3.89	$ 0	C	$6.74	$ 0
B	0.772	2,210	C	4.09	235	F	7.15	176
C	0.781	2,146	A	4.26	502	G	7.42	391
D	0.855	3,785	E	4.95	3,160	B	7.54	712
E	0.965	10,001	F	5.80	1,755	A	8.01	775
F	1.129	4,100	B	5.85	2,885	E	8.39	2,724
G	1.220	9,790	G	5.96	2,849	D	14.39	2,360

Department 4			Total Waste			Cost Standing	
Mill	Unit Cost	Loss over Best	Mill	Percentage	Loss over Best	Mill	Total Loss over Best
G	$ 5.00	$ 0	F	7.4	$ 0	F	$ 6,499
B	6.71	525	B	8.4	1,985	B	8,317
F	6.86	468	E	8.8	6,420	C	9,527
D	7.32	3,798	D	9.0	4,070	A	9,558
C	7.65	995	C	10.5	6,151	D	14,013
A	8.41	1,881	A	11.0	6,400	E	30,155
E	10.51	7,850	G	14.8	18,510	G	31,540

Note: The mills are arranged in order of performance, best to worst. The unit cost is obtained by dividing total cost of the month for each department by output, measured in some appropriate unit such as "thousand square feet." The "Loss over Best" is the difference between total monthly actual cost and what the cost would have been if the best unit cost in that department for all mills had been attained.

Questions

1. Comment on the strong and weak points of the comparative cost report.
2. What would you do next to examine and reduce costs?

CASE 14–4. STALCUP PAPER COMPANY

In March, 1935, the president of the Stalcup Paper Company, while examining a group of charts regarding unit costs submitted to him by the cost department, noted that the unit costs of sorting rags had been rising for approximately two years. In order to determine the reason for this increase, he invited the foreman of the rag-sorting department and the head of the cost department to his office to discuss the matter. The head of the cost department submitted three exhibits, as shown in Exhibits 1, 2, and 3, giving the details of the upward trend in costs shown in the charts. The foreman of the rag-sorting department said that his costs were lower rather than higher than they had been in past years, and that the basis of the cost department's estimates was unsound. He submitted Exhibit 4 in support of this contention.

Exhibit 1

STALCUP PAPER COMPANY

Output of Rag-Sorting Department in Pounds

	1932	1934	Change
Old rags	3,220,000	2,460,000	− 23.6%
New rags	810,000	2,520,000	+211.1%
	4,030,000	4,980,000	+ 23.6%
Percentage old rags	79.9%	49.4%	
Percentage new rags	20.1%	50.6%	

The Stalcup Paper Company used old rags, new rags, and pulp in manufacturing its papers. The proportions in which these materials were mixed were varied in accordance with the requirements for different grades and types of paper. The new rags, which were purchased from textile converters, cost substantially more per pound than old rags, which were purchased through junk dealers. The old rags were usually received in the form of garments, from which it was necessary to remove carefully all foreign materials such as buttons, rubber, and metal. New rags were largely remnants containing only a small percentage of foreign matter requiring removal; consequently, they could be sorted much more rapidly than old rags.

Exhibit 2

STALCUP PAPER COMPANY

Expenses of Rag-Sorting Department

	1932			1934		
			% of Direct Labor			% of Direct Labor
Direct labor		$20,965			$17,185	
Rag-sorting department burden:						
Indirect labor	$ 8,533			$ 9,540		
Repair labor	610			508		
Repair materials	123			271		
Supplies	156			160		
Power	612			553		
Investment	15,549			15,204		
		25,583	122		26,236	153
General overhead		19,128	91		15,186	88
		$65,676			$58,607	

Exhibit 3

STALCUP PAPER COMPANY

Rag-Sorting Department, Costs of Sorting Old and New Rags (As Shown in Cost Records)

	1932		1934	
	Dollars	Cents per Pound	Dollars	Cents per Pound
Old rags:				
Wages	$20,475	0.636	$15,645	0.636
Department overhead	24,985*	0.776	23,885†	0.971
General overhead	18,681	0.580	13,825	0.562
	$64,141	1.992	$53,355	2.169
Increase				0.177
New rags:				
Wages	$ 490	0.0605	$ 1,540	0.0611
Department overhead	598*	0.0738	2,351†	0.0933
General overhead	447	0.0552	1,361	0.0540
	$ 1,535	0.1895	$ 5,252	0.2084
Increase				0.0189

* 122 per cent of wages.
† 153 per cent of wages.

Exhibit 4

STALCUP PAPER COMPANY

Rag-Sorting Department, Costs of Sorting Old and New Rags (As Estimated by Foreman)

	1932		1934	
	Dollars	Cents per Pound	Dollars	Cents per Pound
Old rags:				
Wages	$20,475	0.636	$15,645	0.636
Department overhead	20,441	0.635	12,960	0.527
General overhead	15,285	0.475	7,502	0.305
	$56,201	1.746	$36,107	1.468
Decrease				0.278
New rags:				
Wages	$ 490	0.060	$ 1,540	0.061
Department overhead	5,142	0.635	13,276	0.527
General overhead	3,843	0.475	7,684	0.305
	$ 9,475	1.170	$22,500	0.893
Decrease				0.277

The sorters sat at benches. Their task was to remove all foreign matter from the material placed before them and to distribute the usable cloth, according to quality, into containers placed beside them. The sorters inspected and graded, on the average, 55 pounds of old rags or 575 pounds of new rags per hour. They were paid on a day-rate basis, the management having discovered by experience that payment on a piece-rate basis resulted in picking over rags less carefully.

Between 1932 and 1934 the composition of rags purchased by the Stalcup Paper Company changed considerably, as shown in Exhibit 1. The percentage of old rags to the total dropped from approximately 80 per cent to approximately 50 per cent. During the same interval the total quantity of rags handled increased nearly 25 per cent. In spite of the large increase in total volume, labor costs declined over the period because of the smaller amount of old rags handled.

Costs charged to the rag-sorting department were of three types: first, those incurred for direct labor in the department; second, overhead charged directly to the department; and third, general factory overhead. The amount of general factory overhead charged to a department was obtained by multiplying the direct labor in the department by the ratio of total general overhead to total direct labor in the entire plant.

Both departmental burden and the department's share of general factory overhead were charged to products processed by the department as a percentage of the direct labor applied to these products. This percentage was obtained by dividing total overhead by total direct labor in the department.

The items included in rag sorting department burden were as shown in Exhibit 2. The most important of these were indirect labor, including the salary of the foreman and wages of employees engaged in taking material to and from the sorters, and investment, which included the charge against the department for taxes, depreciation, and insurance on the premises and equipment it used. General overhead included miscellaneous factory labor, building repair labor and materials, manufacturing executive salaries, and expenses of functional departments, such as planning, costing, and research.

The head of the cost department pointed out to the president that between 1932 and 1934 the rag-sorting department burden charge had increased from 122 per cent of direct labor to 153 per cent and that the difference in the cost of rag sorting in the two years was, as shown in Exhibit 3, almost entirely attributable to this increase.

The foreman differed with the cost department's estimated unit costs and pointed out that it was hard to conceive of unit costs increasing while total costs were diminishing and while volume of output was rising. He stated that the cost department was not charging the proper proportion of overhead charges to the new rags and that therefore old rags were taking more than their share of total department burden. He said that, in his opinion, a much sounder method of allocating burden charges would be on a per-pound basis rather than on the percentage-of-direct-labor basis previously used, and he recommended that costs in the rag department in the future should be calculated on the basis shown in Exhibit 4.

The unit costs for old and new rag sorting, as calculated by the cost department, were used in setting up standard costs. These standard costs, however, were only rarely used in setting prices of finished paper since most of the company's paper was sold in a competitive market at prices established by competition. The company used the standard costs mostly as a check on the profit and loss incurred on the various lines of paper manufactured in order to determine which were relatively more profitable. When the plant was being operated at capacity and orders were being refused, the relative profitability of lines was a factor in determining what lines should be discontinued. In 1935, the Stalcup Paper Company was operating at about 55 per cent of capacity.

CASE 14–5. LAW MANUFACTURING COMPANY

In December, 1945, Mr. Burke, controller of the Law Manufacturing Company, sent Mr. Appling, the plant manager, a memorandum dealing with what he thought was an excess amount of indirect labor hours then being expended in the company's plant. The memorandum was the outgrowth of a study by the controller and was intended to call Mr. Appling's attention to a situation which Mr. Burke thought should be corrected.

The Law Manufacturing Company's production reached its wartime peak in the summer of 1943 and thereafter declined sharply. United States war production was still in full swing, but the demand for lathes, which the company manufactured, had for the most part been satisfied. Since 1942 the company had expended considerably more hours per week on indirect labor than on direct labor, a fact which was generally known by the company's executives. They believed, however, that as production decreased, indirect labor hours would decrease proportionately more than direct labor hours and would soon, as in prewar days, be less in total.

When Mr. Burke examined figures for direct and indirect labor for the years 1943–45, he discovered that although both total direct and total indirect labor hours had dropped sharply from the 1943 high, indirect labor hours still exceeded direct labor hours by a substantial margin. This development was contrary to his expectations. Mr. Burke therefore decided to send a memorandum to the plant manager pointing out the apparent need for action.

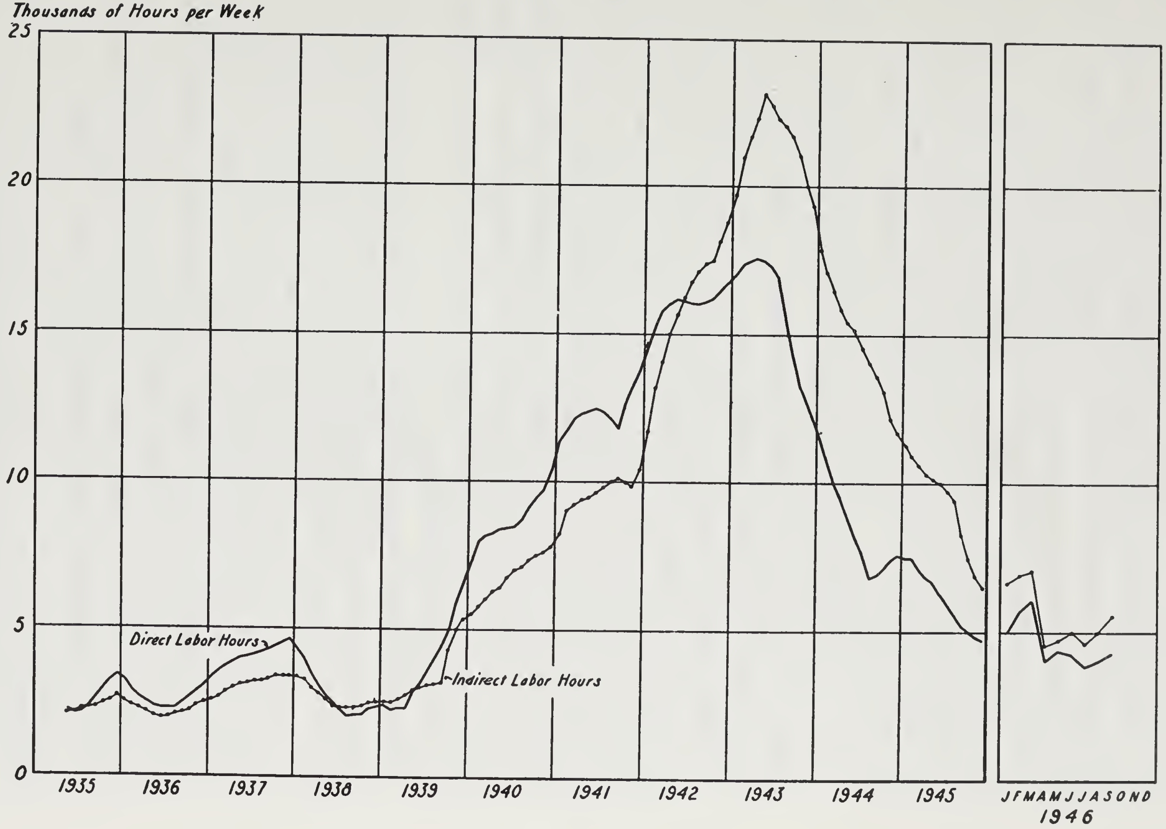
The controller compiled payroll figures on direct and indirect labor for the years 1935–45, and to insure comparability, he adjusted these figures for changes in wage rates. The figures were then sent to Mr. Appling with a brief explanation of their derivation and the purpose for which they had been compiled. A day or two later Mr. Appling saw the controller at lunch and thanked him for sending the information. There was no further discussion of the figures, and Mr. Burke concluded that he had failed to convince Mr. Appling of the existence of a problem and the necessity for taking action.

The controller decided to attack the problem in another way. He sent Mr. Appling figures on postwar dollar expenditures, as compared with prewar dollar expenditures, broken down by department and show-

Exhibit 1

LAW MANUFACTURING COMPANY

Total Hours of Direct and Indirect Labor, 1935–46



ing direct and indirect labor dollars separately. When even this presentation failed to impress Mr. Appling, the controller sent him figures showing prewar and postwar budget estimates for direct and indirect labor and the corresponding actual figures. Mr. Appling looked at all the figures he received and was not insensitive to what they revealed, but apparently he was not moved to take any action.

The controller was somewhat surprised at his failure to convince the plant manager that something had to be done. After considerable thought, he decided that figures presented in tabular form did not focus the issue sharply enough. Accordingly, he constructed a chart, reproduced here as Exhibit 1. The chart had only two lines, one showing total direct labor hours per week and the other total indirect labor hours per week. It was easy to read and demonstrated simply and clearly that in 1945 the company was using more indirect labor hours than direct labor hours, in contrast to prewar years when the reverse was true.

When the chart was presented to Mr. Appling, he showed immediate interest. He agreed that the situation was bad and that an effort should be made to reduce the company's indirect labor hours. He requested the controller to prepare a larger chart suitable for hanging in his office and to post it monthly for the year 1946 so that he could watch the situation closely. Mr. Appling further requested that captions be omitted from the chart. He stated that he knew what the lines meant and that he did not want other people to come into his office and see how bad the situation was.

The large chart was prepared and placed in Mr. Appling's office, and it was posted monthly as he had requested. During the first six months of 1946 the gap between direct and indirect hours was narrowed but not closed. At the end of June Mr. Appling ordered a reduction in indirect labor in all departments of the company, but the reduction failed to keep pace with the decrease in direct labor and the gap actually widened in July and August. Mr. Appling's assistant refused, however, to become alarmed at the bad showing in July and August. He pointed out that the Planning Department soon intended to release seven people and that the indirect labor curve would then drop sharply.

Questions

1. Should the company have been concerned about the excess of indirect labor hours over direct labor hours?

2. Do the incidents described in this case demonstrate that charts are more effective than tables? If not, what, if anything, do they demonstrate?

3. Should Mr. Burke feel that the situation is reasonably well under control if the "gap between direct and indirect hours" is closed?

4. How else might the company go about attempting to control indirect labor costs?

CASE 14–6. MONTGOMERY WARD & COMPANY

Mr. George Jessup was one of the junior managers in an operating division of Montgomery Ward & Company's Fashion House in Chicago. Fashion House did a mail-order business in women's clothing. Mr. Jessup was supervisor of a unit engaged in the inspection and preparation for stock of women's coats. It was his job to see that the work of his Examination and Preparation unit, as it was called, was done carefully yet efficiently and economically.

Functions of the Examination and Preparation Unit

The procedure in examining and checking shipments of new merchandise in Mr. Jessup's unit was elaborate, particularly in the early part of each season. For a period of two or three weeks a thorough examination was conducted of all coats received, regardless of the manufacturer or the type of coat. The examination routine consisted of a careful inspection of the stitching, the condition of the cloth and lining, the evenness of hems, and other features. Comparison was made with a sample approved by the Montgomery Ward buyer. Each coat was placed on a model so that inspectors could see if it fitted properly; sometimes live models were used. If a manufacturer's shipments were consistently satisfactory as the season progressed, a less thorough examination of each coat, called a spot check, was made. The spot check was a quick, over-all inspection of the quality of the garment and a check on the presence of all accessories. Substantially the same procedure was followed for merchandise returned by customers.

In the examination and preparation unit, operators were stationed at work tables, and floor boys were employed to bring merchandise in and later to remove it to stock, or wherever it was to go. Every afternoon each girl reported, on a specified form, the number of coats she handled and the number of hours she spent on the work. Each girl filled out her daily report at about half an hour before closing time, including thereon her estimate of work for the remainder of the day. These forms were then countersigned by the floor supervisor, whose responsibility it was to see that the work was done by the close of the day.

There were three classes of employees in Mr. Jessup's unit. The first was a group of "basic regular" operators, who were guaranteed thirty-eight hours a week for fifty weeks in the year. This group was ordinarily limited to the minimum number of employees required to handle the lowest weekly volume in the year. The second group of workers was known as "nonbasic" and was guaranteed thirty hours of work a week. Finally, there were temporary workers who were employed to meet peak demands. The only requirement of their use was that if a girl was taken on, she had to be given at least four hours of work for that day.

Budget Procedure

At the beginning of the spring season, which ran from February through July, the store prepared a six-month key budget of income, expense, and net profit by months. This general budget was based on all known factors, including national and local economic conditions, anticipated trends, and planned company policies. Based on the sales estimate in this budget, Mr. Jessup made up a budget for his unit showing the number of hours of labor that would be required in the various activities under his charge and also the expected rate of output per man-hour. In addition, on the fifteenth of each month Mr. Jessup prepared a budget for each week of the coming month. In preparing these weekly budgets he used the estimates of the merchandisers as to the volume of shipments to be received into the Examination and Preparation unit, and also the recorded performance for the corresponding period in the preceding year. Both the semiannual budget and the weekly budgets were submitted to the expense controller, who either approved them as presented or discussed revisions with Mr. Jessup.

Every Wednesday morning Mr. Jessup prepared a revised weekly budget for the coming week, again showing the expected hours of work to be spent in the several lines of activity in his department. This revised weekly budget, which also had to be approved by the expense controller, set the standard against which the performance of Mr. Jessup's unit would be judged by his superiors. After his weekly budget had been approved, Mr. Jessup divided his week's estimate according to days in order to follow daily performance. While he might be in the red on any one day, it was expected that at the end of the week the total hours spent would not exceed his budget.

The Expense Control Department maintained a budget book that showed for each unit the total hours worked each day and the budgeted hours for that day, with summary figures for each week. A copy of this book was in the office of the superintendent of operations, and a copy of his own record, day by day and week by week, was also available to the head of each unit. The management believed that effective control required good planning and a careful watch on daily performance, and it therefore wanted results and not excuses. It approved prompt corrective action taken in order to attain an objective; it did not approve the use of unproductive time spent in explanation of why the objective had not been reached.

Performance Reports

For comparison with his budget, daily performance reports of output and hours worked in Mr. Jessup's unit were compiled by one of his clerks from the daily work reports filed every afternoon by each of the operators. The ratio of total output to total hours worked provided a measure of output per man-hour, after an adjustment had been made by applying a weighting factor that reflected the amount of work involved in the several operations.

Exhibits 1 and 2 show budgeted and actual performance reports, respectively, for the week ended May 15, 1941. In column 1 is listed the budgeted or actual output, in number of coats, of Mr. Jessup's unit. In column 2 is listed the budgeted or actual number of hours worked.

Lines 1–6 and 10 relate to direct labor used in the examination and

Exhibit 1

MONTGOMERY WARD & COMPANY

Labor Budget for Examination and Preparation Unit
Week Ending May 15, 1941
(Revised Figures in Parentheses)

APPROVED BUDGET ESTIMATES

		1	2	3	4	5	6
		ACTUAL OUTPUT	HOURS WORKED	OUTPUT PER MAN HOUR (1 ÷ 2)	WEIGHTING FACTOR	WEIGHTED OUTPUT (1x4)	CARRY-OVER
1	EXAMINATION OF NEW MERCHANDISE	(10000) 5970	(286) 171	35.0	.63	(6300) 3761	
2	PREPARATION OF NEW MERCHANDISE	(9000) 4220	(300) 141	30.0	.73	(6570) 3081	
3	INSPECTION OF CUSTOMER RETURNS	(3100) 3600	(140) 163	22.0	1.00	(3100) 3600	
4	PREP. & LISTING OF CUSTOMER RETURNS	(3100) 3600 (2790) 3240	(12) 14 (96) 112	257.0 29.0	.09 .76	(279) 324 (2118) 2462	
5	IRREGULARITY HANDLING	(700) 520	(30) 23	22.6	.94	(658) 489	
6	R.G. & JOB SALE MDSE. HANDLING	(1000) 880	(20) 18	48.9	.44	(440) 387	
7	UTILITY		(148) 105				
8	CLERICAL		(79) 63				
9	SUPERVISION · INSTRUCT. TIMEKEEPING		(90) 78				
10	Sign-up	(1860) 2160	(124) 144	15.0	1.47	(2734) 3175	
11	Additional	100	(3) 3	35.0	.63	63	
12	TOTAL		(1328) 1035	16.76		(22262) 17342	

Exhibit 2

MONTGOMERY WARD & COMPANY

Actual Labor Performance, Examination and Preparation Unit
Week Ending May 15, 1941

ACTUAL PERFORMANCE

	Receipts 6463	1	2	3	4	5	6
		ACTUAL OUTPUT	HOURS WORKED	OUTPUT PER MAN HOURS (1 ÷ 2)	WEIGHTING FACTOR	WEIGHTED OUTPUT (1x4)	CARRY-OVER
1	EXAMINATION OF NEW MERCHANDISE	7042	224 6/12	31.2	.63	4427	12991
2	PREPARATION OF NEW MERCHANDISE	9023	278 3/	32.4	.73	6587	11620
3	INSPECTION OF CUSTOMER RETURNS	4046	156 2/	26.0	1.00	4046	
4	PREP. & LISTING OF CUSTOMER RETURNS	4603 5219	12 11/ 160 8/	358. 32.6	.09 .76	414 3967	
5	IRREGULARITY HANDLING	120	3 10/	31.7	.94	113	
6	R.G. & JOB SALE MDSE. HANDLING	2833	65 4/	43.3	.44	1247	
7	UTILITY		167 7/				
8	CLERICAL		164 10/				
9	SUPERVISION - INSTRUCT. TIMEKEEPING		119 9/				
10	Sign-up	1761	122 5/	14.4		2589	
11	Additional		19				
12	TOTAL		1495 3/	15.6		23390	

the preparation for stock of both new and returned merchandise. Other lines relate to the activities of floor boys and other service employees, clerical help, and the various supervisors including Mr. Jessup. Since supervisors on the floor were required to do some of the routine work themselves when they were not busy otherwise, Mr. Jessup was restricted in the number of hours he could budget for supervision. When the department was busy, it was presumed that there would be more time spent in supervision than when work was slack.

The weighting factors in column 4 reflect the relative amounts of time normally required to do the several operations. The figures are not in units of time but are in relative units, the activity taking the longest time (excluding "sign up") being expressed as 1.00. For example, the activity reported on line 1 was supposed to take 63 per cent as much time as the activity reported on line 3. The entries in column 5 are the measures of weighted output obtained by multiplying output figures by the weighting factors. The outputs per man-hour in column 3 are the simple ratios of output to hours worked. The over-all output per man-hour figure (16.76 budgeted and 15.6 actual) is derived from the total weighted output figure of column 5.

Column 6 was used to record the quantity of work on hand, i.e., carryover, at the end of the week. Inasmuch as shipments of new merchandise did not arrive every day, a stock of unexamined merchandise was ordinarily kept in Mr. Jessup's unit in order to even out his daily workload. Ordinarily this unexamined stock amounted to one or two days' work. As indicated on Exhibit 2, the unit received 6,463 new coats during the week ended May 15.

The reports shown in Exhibits 1 and 2 were sent to Mr. Phillips, superintendent of Division 10 of Fashion House, who was Mr. Jessup's immediate superior. Since performance of the Examination and Preparation unit for the week was below the budget, Mr. Jessup was required to make a written explanation. This accompanied the reports and read as follows:

> The following factors were responsible for the failure to meet budget requirements:
>
> The transfer to the division of the handling of even exchanges (customers' returns). Time had to be spent explaining the new procedure to all sign-up clerks as well as the additional time required to handle the added activity.
>
> The transfer to the Examination and Preparation payroll of two employees (Brown and Swenson). Since no provision had been made for training during this week, examination output suffered. Assuming that the new examiners produced 50% of normal output, 40 hours additional were required, plus instruction time.
>
> Twenty-four hours spent by Jones preparing drawings of the new preparation and examination fixtures and having them priced by the Plant Engineer.

Questions

1. What aspects of Mr. Jessup's job (speed, quality, cost, etc.) should Mr. Phillips be interested in controlling?

2. Insofar as you can determine, how well did Mr. Phillips perform each of these aspects during the week ended May 15? Are you satisfied with Mr. Jessup's explanation?

3. What action, if any, should Mr. Phillips take?

Chapter 15

CONTROL: ANALYSIS OF COST ACCOUNTING VARIANCES

An accounting technique often used as a basis for appraising performance is the comparison of actual cost to standard cost. The variance, which is the difference between actual cost and standard cost, is sometimes taken as a *prima facie* indication of good or poor performance depending on whether it is favorable (a credit amount) or unfavorable (a debit amount). Although such a presumption is incorrect, some useful inferences about performance can often be obtained by a careful analysis of variances.

One obvious reason why the variance between actual and standard cost may not reflect good or poor performance is that the standard cost may not be a reliable indication of expected costs. This can happen under either or both of two circumstances: (*a*) the standard was not set properly at the outset; or (*b*) although set properly under conditions existing at the time, these conditions have changed so that the standard has become obsolete. Unless there is some way of making an approximate correction in a standard containing such errors, the difference between actual and standard means nothing. Without attempting to minimize the importance of the problem of setting a standard, we shall assume for the remainder of this chapter that the standard has been properly set.

Even so, the variance may not directly reflect performance since it may result from a mixture of factors, some of which are controllable by the spending supervisor and others of which he cannot control. There are, however, techniques for analyzing a variance in an attempt to separate out—at least approximately—the controllable portion. Two of these techniques are described in this chapter. One is applicable to direct labor and direct material variances, and the other to overhead variances.

As will be pointed out, these techniques are strictly mechanical; hence, although they may provide a starting point, they are by no means a complete solution to the problem of evaluating performance.

DIRECT LABOR AND DIRECT MATERIAL

The standard labor cost of a unit of product is essentially constructed by multiplying the standard time (e.g., number of hours) required to produce that unit by a standard rate per unit of time (e.g., standard wage rate per hour). Total standard labor costs for an accounting period are found by multiplying the standard labor cost per unit by the number of units worked on. When employees are paid on an hourly basis, actual labor costs for the period are of course the product of actual hours worked times the actual wage rate per hour. These relationships suggest that it should be possible to break the variance between actual and standard labor costs into two components: (1) the variance caused by the fact that actual *time* differed from standard time, and (2) the variance caused by the fact that actual *rates* differed from standard rates.

A commonly used pair of rules for isolating the effects of these components follows:

1. The *time* variance is the difference between standard hours and actual hours, priced at the standard rate per hour. (This variance is also known as a "quantity," "spending," or "efficiency" variance, although the latter two terms connote too strong an inference as to the meaning of the results.)

2. The *rate* (or "price") variance is the difference between the standard rate per hour and the actual rate per hour multiplied by the actual number of hours.

The *net* variance (or *total* variance) is the difference between the time and rate variances if one is unfavorable and the other is favorable, and it is the sum of the time and rate variances if both are unfavorable or if both are favorable. The net variance is also, of course, the difference between actual cost and standard cost. It follows that if the time variance is found by Rule No. 1, the rate variance can be found by subtracting the time variance from the net variance.

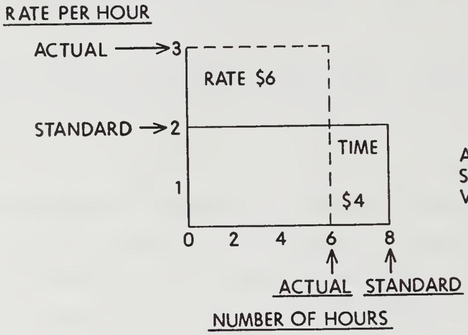
The application of these rules is illustrated in Illustration 15-1, which is a diagram of this situation:

	Actual	*Standard*
Hours to produce one unit	6	8
Wage rate per hour	$ 3	$ 2
Cost (rate times hours)	$18	$16

In the diagram, the solid rectangle indicates the standard cost (8 hours × $2 = $16), and the dotted rectangle indicates actual cost (6 hours × $3 = $18). The variances are the areas where the two rectangles do not coincide. The *time* variance is 2 hours times $2 per hour, or $4; it is favorable because actual time is less than standard time. The *rate* variance is $1 times 6 hours, or $6; it is unfavorable because the actual wage rate exceeds the standard rate. The net variance is the difference between these two variances, or $2. (The net variance is also, of course, the difference between actual cost and standard cost.)

Illustration 15–1

ILLUSTRATION OF COMPUTATION OF TIME AND RATE VARIANCES



	TOTAL
ACTUAL	$18
STANDARD	16
VARIANCE	$ 2

The Gray Area

A problem arises when both the time and rate variances are favorable, or when both are unfavorable. The difficulty can be illustrated by Illustration 15–2, which reflects the following situation:

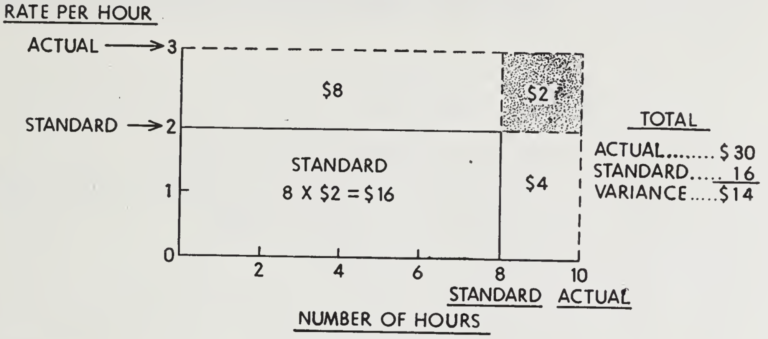
	Actual	*Standard*
Hours to produce one unit	10	8
Wage rate per hour	$ 3	$ 2
Cost	$30	$16

In this situation, the unfavorable net variance of $14 is partly the result of the high wage rate and partly the result of the longer time required, but there is no logical way of determining how much of the $14 is explained by each of these causes. Clearly, at least $8 of the variance is a rate variance resulting because the work was done at a rate that was $1 per hour higher than standard, and at least $4 results because actual hours exceeded standard hours. But what of the remaining $2? It is an inextricable combination of the influence both of the high rate and the long time.

The only solution to this problem is to adopt an arbitrary rule for assigning the $2 "gray area" above. There are three possible rules: (1) assign all of the $2 as rate variance; (2) assign none of the $2 as rate variance; or (3) assign *part* of the $2 as rate variance. Of these three possibilities, the first is probably the most common and is consistent with the general rules given above. The third is rarely used because it involves additional arithmetic. Whichever is chosen, it is important that the same rule be used throughout the company; otherwise comparisons are invalid. Assuming that all of the $2 "gray area" is to be assigned to *rate variance,* the rules given above are followed.

Illustration 15–2

ILLUSTRATION OF COMPUTATION OF TIME AND RATE VARIANCES



The reason for attempting to break down the total labor variance as described above is that the rate variance and the time variance are often evaluated in different manners. The rate variance may arise because of a change in wage rates for which the foreman cannot be held responsible, whereas the foreman may be held entirely responsible for the time variance on the grounds that he can control the time required to do a given job.

This distinction cannot be made in all cases, for there are many situations in which the two factors are interdependent. For example, the foreman may find it possible to complete the work in less than the standard time by using men with a higher than standard rate, and he may have been perfectly justified in doing so. Even so, the use of the technique described above may lead to a better understanding of what actually happened.

Some Causes of Labor Variances

The technique described provides only a partial understanding of the cause of the labor variance. It does not isolate any of a great number of other factors that may cause a difference between actual and standard labor costs. An incomplete list of such factors is:

1. A standard labor cost per unit is valid only if labor costs vary proportionately with the number of units produced. Labor costs, in fact, may not vary proportionately with volume at all levels of production.
2. The measure of volume (e.g., number of units, pounds of product, etc.) may not be an accurate indication of the amount of direct labor required. For example, a standard labor cost of $1 per pound implies that each pound of product requires the same amount of labor, which, in fact, may not be true.
3. The volume figure used to compute total standard costs may be different from the volume that generated the actual labor costs, either because of the nature of the system or because of clerical errors.
4. The elements included in standard cost (e.g., overtime, fringe benefits, shift premium) may differ from the elements included in actual costs.
5. Spoilage may not have been allowed for properly.
6. Quality may have suffered or improved.
7. Labor performance may have affected, or may have been affected by, factors that are reflected in material or certain overhead costs.
8. There may have been changes in morale which have not affected current costs but which may have an important effect on future costs.
9. The total actual costs and the total standard costs for a period may be influenced by offsetting forces for individual products or individual responsibility centers. The totals conceal these underlying forces.

If the objective is to isolate that portion of the variance that is the result of efficiency or inefficiency and to hold the supervisor responsible for this portion, factors of the type mentioned above must be considered.

Material Cost Variances

The variance between actual and standard direct material costs can be broken down into what are commonly called *material usage variance* and *material price variance* by the same technique as that described above for direct labor. The diagram in Illustration 15–1 is made applicable to material costs simply by changing the names:

	Actual	*Standard*
Quantity (pounds) used to produce one unit	6	8
Price per pound	$ 3	$ 2
Material cost	$18	$16

The *usage* variance is 2 pounds times $2 per pound, or $4; and the *price* variance is $1 times 6 pounds, or $6.

In some companies, the cost accounting system is constructed so that the price variance is removed as a part of the regular accounting entries; if such a system is used, there may be no need to separate out the price variance by the method described above. For example, if a company takes raw material into inventory at a standard price, the price variance is set up at the time the purchase is recorded. Raw Material Inventory is debited at standard cost, Accounts Payable (or Cash) is credited at actual cost, and the difference is debited or credited to Material Price Variance. Even in such a case, a sort of price variance may later appear if material of a different *quality* than standard (hence, with a different standard cost) is used in the production process.

OVERHEAD

In order to understand the overhead variance, one must first know something about the behavior of overhead costs. Overhead is a collective name for a number of separate cost items with different cost characteristics. Although the behavior of these costs can be studied in relation to any one of a number of variables, the variable we are interested in here is *volume,* i.e., the level of activity at which the plant is operated.

Measures of Volume

Volume may be expressed in terms of the number of direct labor hours, direct labor dollars, number of units produced, percentage of capacity, total cost of goods produced, or any of several other measures. The best "measuring stick" of volume is the one that most closely reflects the conditions that cause costs to change. Often a measuring stick expressed in dollar terms (such as direct labor *dollars*) is less satisfactory than a measuring stick expressed in nondollar terms (such as direct labor *hours*), for changes in a dollar figure may reflect changes in price levels (i.e., wage rates) as well as changes in the level of activity. As a practical matter, however, a dollar figure may be the only measure that is conveniently available, and it is therefore often used.

Patterns of Cost Variation

Most overhead costs behave according to one of the following three patterns:

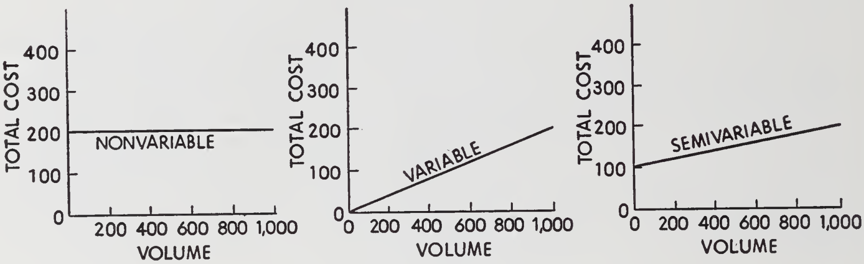
Variable costs vary directly and proportionately with volume; that is, as volume increases 10 per cent, the cost increases 10 per cent. Lubricants, power costs, and supplies often are examples of variable overhead costs.

Nonvariable costs do not vary at all with volume. Building depreciation, property taxes, supervisory salaries, and occupancy costs (heat and light) often behave in this fashion. These costs are sometimes called "fixed" costs, but this term implies that they cannot be changed, which is not so.

Semivariable costs vary directly, but less than proportionately, with volume. Examples may be indirect labor, maintenance, and clerical costs.

A generalized picture of the behavior of these types of cost is shown in Illustration 15–3. The nonvariable cost is $200 regardless of the level of activity; the variable cost is $0.20 per unit of volume; and the semivariable cost starts at $100 and increases at a rate of $0.10 per unit of volume. Note that the semivariable cost can be broken into two elements, a nonvariable element of $100 and a variable element of $0.10 per unit.

Illustration 15–3



Incidentally, certain characteristics of these diagrams should be noted since they are common to all diagrams showing the relationship between cost and volume. In such diagrams costs are always plotted on the vertical or y axis, and volume is plotted on the horizontal or x axis. A conventional rule in geometry is that the "dependent variable" is plotted on the y axis and the "independent variable" is plotted on the x axis. In the above diagrams, therefore, cost is implicitly assumed to be the "dependent variable" and volume the "independent variable." In these diagrams, the measure of volume is not defined; as pointed out above, it may be units, percentage of capacity, direct labor hours, or some other measure that is believed to be a reliable indicator of plant activity.

If the separate overhead cost elements behave according to one of the three patterns shown above, then the total overhead cost, which is the sum of these separate elements, must vary with volume somewhat as shown in Illustration 15–4 which was constructed by merging the separate elements.

Since the semivariable item can be split into nonvariable and variable components, the behavior of total overhead costs can be described in terms of only two components, the nonvariable portion of $300 and a variable portion of $0.30 per unit of volume. From this point on, we shall therefore disregard the semivariable element as a separate category and consider only the nonvariable and variable components.

Illustration 15–4

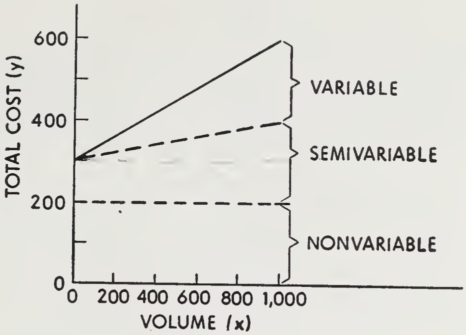
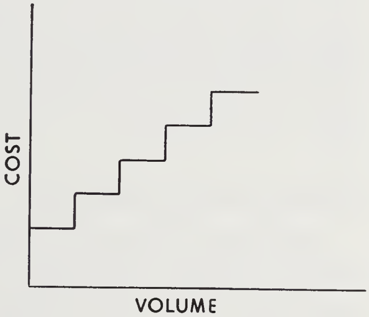


Illustration 15–4 is based on several implicit assumptions as to the behavior of costs, of which two are discussed below. The first is relatively unimportant, but the second is extremely important.

One assumption is that all overhead costs behave according to one of the three patterns described above. Actually, some costs may vary in steps, as in Illustration 15–5. Others may vary along a curve rather than a straight line, and others (such as maintenance of idle machines) may actually decrease as volume increases. In most situations, however, the effect of these discontinuities and nonlinear cost functions on total overhead costs is minor, and the assumption that total overhead costs vary in a linear relationship with volume is a satisfactory working approximation.

Illustration 15–5



The more important assumption implicit in Illustration 15–4 is that overhead costs move along a single straight line throughout *the whole range* of volume. Actually, this is quite unlikely to happen. At zero volume, for example, when the factory is shut down, a special set of conditions operate, and these may make overhead costs considerably higher or considerably lower than the $300 shown in the diagram. When production gets so high that a second shift is required, costs may behave quite differently from the way in which they behave under one-shift operations. Even within the limits of a single shift, it is to be expected that costs will behave differently when the factory is busy than when it is operating at low volume levels. In short, a single straight line gives a good approximation of the behavior of costs only within a certain range of volume. We can indicate this fact by modifying our cost diagram, as shown in Illustration 15–6.

Illustration 15–6

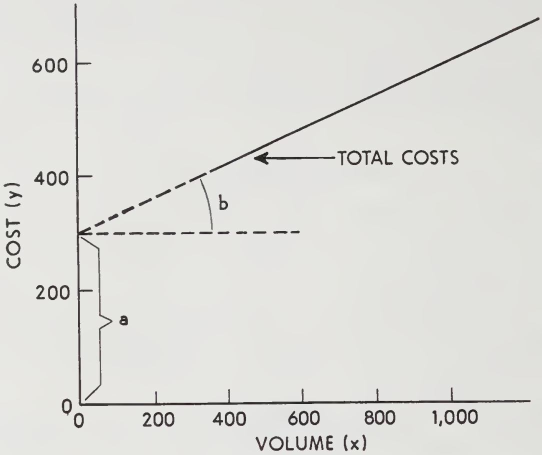


Illustration 15–6 shows the same cost pattern as Illustration 15–4. The only change is that the solid line representing total costs now extends only over a selected range of volume, here 300 units to 1,000 units. The dotted line extending back to zero does not imply that costs will behave in this fashion at low volumes; rather it is drawn on the diagram solely as a means of finding the nonvariable component of total costs.

Formula for the Cost Line

As already pointed out, overhead cost at any volume is the sum of the nonvariable component ($300) and the variable component ($0.30 per unit). For example, at a volume of 1,000 units, overhead cost is $300 + ($0.30 per unit times 1,000 units) = $600. Designating cost as y, volume as x, the nonvariable component as a, and the variable component as b, the cost at any volume can be found from the formula, $y = a + bx$. You may recall from geometry that this is simply the general formula for a straight line.[1]

If the values of a and b for a given line are not known, they can be found, provided total costs are known for any two points or volume levels on the line. One method of doing this is as follows:

---

[1] In many geometry texts, the notation used is: $y = mx + b$. In such a notation, m represents the slope, or cost per unit, and b represents the "y-intercept," i.e., the nonvariable component.

1. Subtract cost at the lower volume from cost at the higher volume;
2. Divide the difference in cost by the difference in volume, which gives *b*, the amount by which cost changes with a change of one unit of volume;
3. Multiply either of the volumes, *x*, by *b* and subtract the result from the total cost at that volume, thus removing the variable component and leaving the nonvariable component, *a*.

Budgeted Costs

In many practical situations overhead costs are expected to vary with volume in the straight-line relationship shown in Illustration 15–6. The formula for this line of expected or "budgeted" costs can be estimated by any of the following methods:

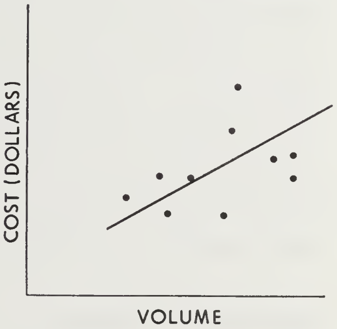
1. Estimate the cost at any two volumes, which establishes two points on the line. Find the values of *a* and *b* by the method described above. (This is sometimes called the "high-low" method because one of the volumes selected is likely to be high, and the other is likely to be low.

2. Estimate the cost at one volume, and estimate how cost will change with a given change in volume. This gives *b* directly, and *a* can be found by subtraction, as described above.

3. Build up separate estimates of the behavior of each of the elements that make up total overhead cost.

4. Make a "scatter diagram" in which actual costs recorded in past periods are plotted against the volume levels in those periods, and draw a line that best fits these observations. Such a diagram is shown in Illustration 15–7. A statistical technique, called the "method of least squares" is often used to find the line of best fit (see Appendix, p. 316), but in many cases, a line drawn by eye is just as good as, and in some cases it is better than, a mathematically fitted line.

Illustration 15–7



Whatever, the method used, the result is a line, described by the formula $y = a + bx$, which shows how costs are expected to vary with volume. In the following analysis, this is called the line of *budgeted cost.*

Standard Cost

A standard overhead cost, or *burden rate,* per unit of volume is determined by selecting a single volume and determining the expected cost per unit at that volume. This is done by dividing total costs at that volume by the number of units which that volume level represents. The selected volume level at which the standard overhead cost is calculated is called the *standard* or *normal* volume. As pointed out above, volume may be expressed in terms of direct labor hours, units of product, or any other measure of plant activity, and the burden rate is expressed in the same terms. If, for example, volume in the above diagram means direct labor hours and normal volume is taken to be 1,000 hours, the burden rate is \$600 ÷ 1,000 hours, or \$0.60 per direct labor hour. The use of the burden rate in a cost accounting system has been described in Chapter 10.

Absorbed Cost

Absorbed cost is the cost that is absorbed as a cost of the product in the cost accounting system. In any given accounting period, therefore, absorbed cost is found by multiplying the burden rate per unit of volume by the number of units of volume occurring in that period. If, for example, the burden rate is \$0.60 per direct labor hour, and 900 direct labor hours were worked during the period, \$540 of overhead cost would be absorbed; that is, \$540 of overhead cost would be taken into inventory. In more general terms, if the burden rate is represented by the symbol, b', then the absorbed cost in any period is b' times the volume of that period, or $y = b'x$. This formula has no a, or nonvariable component, which is another way of saying that absorbed costs vary *proportionately* with volume.

In Illustration 15–8 a line showing absorbed costs has been added to the previously described line of expected or budgeted costs. Note that the budgeted cost and absorbed cost lines coincide *only* at the standard volumes. At volumes lower than standard (illustrated by d on the diagram), absorbed costs are less than budgeted costs; that is, costs should be *underabsorbed.* At higher volumes, costs should be *overabsorbed,* as illustrated by e on the diagram.

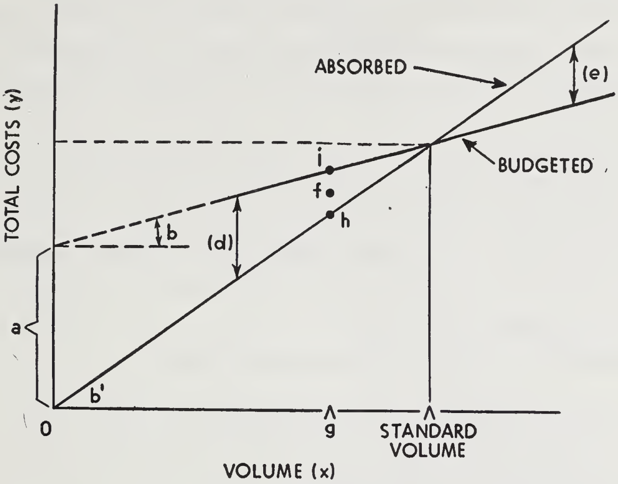
Overhead Variances

The overhead variance is the difference between actual costs and absorbed or standard cost.

Since absorbed costs differ from budgeted costs at all volumes other than the standard volume, the variance does *not* represent a difference between actual and expected spending unless actual volume in the period happens to be the same as standard volume. Thus, the significance of the overhead variance cannot be understood unless the effect of volume is taken into account.

The effect of volume is measured by the *volume variance,* which is the difference between absorbed cost and budgeted cost at the volume level actually attained during the period. The volume variance results solely from the fact that actual volume in a given period differed from the standard volume.

Illustration 15–8



If everything went as expected during an accounting period, actual costs incurred would coincide with budgeted costs at the level of activity prevailing in the period. For a variety of reasons, actual costs will probably be different from budgeted costs, and the difference is called the *spending variance.* For control purposes, the spending variance is of particular interest. It is often called the "efficiency" or "performance" variance, but this implies that it is solely the result of the performance of the person responsible for the cost, whereas actually a number of other variables may have influenced it. Among these noncontrollable variables are changes in prices, the method of overhead allocation, the rate and direction of change in volume, and changes in methods. There are many other possibilities. Nevertheless, the spending variance is a useful starting point in appraising the supervisor's performance.

The overhead variance, as shown in the accounting records, is the algebraic sum of the volume variance and the spending variance. It is therefore useful to break down this *accounting variance* (or "net variance") into its two components. The method for doing this can be illustrated in Illustration 15–8 in a month when actual costs are at the point marked f and actual volume was g. Absorbed costs at this volume will be the amount h on the absorbed cost line, and budgeted costs will be the amount j. The following relationships will hold:

The *accounting* or net variance is the difference between absorbed costs, h, and actual costs, f. In the example, costs are underabsorbed.

The *volume variance* is the difference between absorbed costs, h, and budgeted costs, j. In the example, this variance is unfavorable.

The *spending variance* is the difference between budgeted costs, j, and actual costs, f. In the example, this variance is favorable.

The accounting variance is also the algebraic sum of the volume variance and the spending variance. (The "favorable" and "unfavorable" variances can of course be designated by + or — signs, but most people find it easier to insert the proper signs from a consideration of the relationships in a specific situation rather than attempting to memorize a set of algebraic formulas.)

To recapitulate, using numbers, assume that:

> Actual volume in an accounting period is 900 units,
> Actual cost is $560,
> The budget formula is $300 plus $0.30 per unit, and
> The overhead rate is $0.60 per unit.

Then:

Budgeted cost at the actual volume = $570
Absorbed cost at the actual volume = 540
Accounting variance $560 – $540 = 20 (underabsorbed)
Volume variance 570 – 540 = 30 (unfavorable)
Spending variance 570 – 560 = 10 (favorable)

Interpretation of the Variances

Presumably, the supervisor is responsible for the spending variance that arises in his responsibility center. Because the budgeted cost line cannot take account of all the noncontrollable factors that affect cost, there may be a reasonable explanation for the spending variance. The existence of an unfavorable variance is therefore not, by itself, grounds for criticizing performance. Rather, it is a signal that investigation and explanation are required.

In some situations the supervisor may also be responsible for the volume variance. A failure to obtain standard volume may result from his inability to keep products moving through his department, for example. It is more likely, however, that the volume variance is someone else's responsibility. For example, it may result because the sales department was unable to obtain the required volume of orders.

Selling Costs Are Different

The foregoing analysis rests on the assumption that overhead costs vary with volume; that is, that a change in volume "causes" a change in cost. This assumption is usually reasonably valid for manufacturing costs, but it may be fallacious for other types of cost, especially selling costs.

Some selling costs may indeed vary with volume. If salesmen are paid on a straight commission basis, for example, commission expense will vary directly and proportionately with sales volume. This kind of cost should be carefully distinguished from two others, however. These are:

1. *Costs That Cause Sales to Vary.* True selling costs are costs incurred *in order to get* sales. For these costs, if there is any relationship between costs and sales volume, the relationship is the inverse of the one illustrated on the preceding diagram; that is, sales is the dependent variable and cost is the independent variable. Advertising cost may be an example, if there is in fact a relationship between advertising spending and sales volume.

2. *Costs That Vary at the Discretion of Management.* Some costs may appear to vary with sales, but the real cause of the variation may be that management permits such a variation rather than any underlying causal relationship. Advertising costs may again be used as an example. Management may decide either (1) to increase advertising expenditures when sales *increase,* on the theory that the company can afford to spend more in times of high volume; (2) to spend the same amount for advertising regardless of sales volume; or (3) to increase advertising expenditures when sales *decrease,* in the hope of regaining the lost volume. The effect of each of these policies can be shown on a cost-sales diagram that superficially resembles that shown in Illustration 15–8, but the fact of the matter is that these diagrams reflect *not* a causal relationship between costs and volume but rather the implementation of a management decision.

An understanding of these causes of cost variation is essential in interpreting the behavior of selling costs. If the historical relationship of cost and volume is plotted on a scatter diagram, a clear pattern or line of relationship may emerge, but such a pattern should not be interpreted as meaning that costs vary *because* of volume, unless there is good reason to believe that a cause-and-effect relationship does in fact exist. The same caution should be observed in the case of research and development costs, certain other general and administrative costs, and even certain types of manufacturing costs.

SUMMARY

In this chapter, two types of mechanical aids in analyzing variances have been described. Both are useful first steps in understanding the cause of the variances that are reported in a standard cost system, but neither provides anything more than a first step.

One technique makes it possible to break a direct labor variance into two components, a time variance and a rate variance. Presumably, in the appraisal of performance, attention is focused primarily on the time variance. The same technique makes it possible to break a direct material variance into two similar components, a quantity variance and a price variance, with attention presumably being focused on the former.

The other technique makes it possible to break the overhead variance into two components, a volume variance and a spending variance. The supervisor is presumably responsible for the spending variance, but he may have no responsibility for the volume variance. This technique assumes that there is a cause-and-effect relationship between costs and volume, which is a reasonably valid assumption in many factory situations, but which is not valid in many other situations, particularly in the selling cost area.

APPENDIX

NOTE ON FITTING A STRAIGHT LINE BY LEAST SQUARES

A. *The Equation for a Straight Line*

If the variable measured on the vertical axis be y and that on the horizontal axis be x, then *any* straight line is described by the general formula, $y = a + bx$. In order to describe a *specific* straight line, we must assign specific numerical values to the two constants (or "parameters"), a and b.

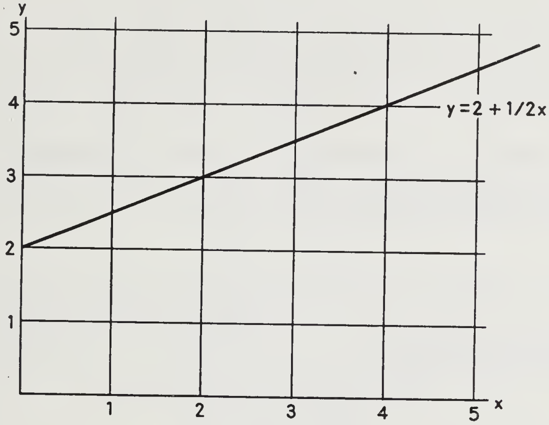
These two numbers have very simple meanings: a is the *ordinate* ("height") at which the line cuts the y axis (at the y axis $x = 0$ and therefore $bx = 0$ and therefore $y = a$); b gives the *slope* of the line (the amount by which y increases when x increases by one unit). (When b is negative, it means that y *decreases* when x increases.)

Example: Illustration 15–9 shows the line $y = 2 + \frac{1}{2}x$. Notice that the line cuts the y axis at a value of 2, and that for each unit increase in x, y increases $\frac{1}{2}$ unit.

B. *Fitting Straight Lines by Least Squares*

The technique of fitting a straight line by the method of least squares makes use of this formula for a straight line. We assume here that the distances from the point to the line are measured *vertically,* i.e., parallel to the y axis. We write down in two adjacent columns every value of x and beside each value of x the corresponding actual value of y. In a third column we put the square of each value of x, and in the fourth, the product of each x times the corresponding y. We total each column and use the symbol Σxy to denote the total of the products of x times the corresponding y, etc. (Notice that Σx^2 does *not* denote the square of the sum of the x's, nor does Σxy denote the total of the x's times the total of y's.) We then determine the constants a and b in the equation for a straight line by solving the two simultaneous "normal equation":[2]

Illustration 15–9



$$\begin{aligned} Na + b\ (\Sigma x) &= \Sigma y \\ a\ (\Sigma x) + b\ (\Sigma x^2) &= \Sigma xy \end{aligned}$$

N is the number of items, i.e., the number of x, y pairs.

Suppose we have the following data (simplified for the purpose of illustration):

---

[2] Students who have had calculus may be interested in the derivation of these normal equations. The ordinate of the line for any particular value of x is $a + bx$. The vertical distance from this point on the line to the point representing the *actual* value of y corresponding to this value of x is $(y - a - bx)$, and the square of this distance is $(y - a - bx)^2$. (We do not worry about the algebraic sign of the distance, i.e., about whether the point is above or below the line, because we are going to square it anyway.) The sum of the squares of the distances is to be minimized: $\Sigma(y - a - bx)^2 = \text{minimum}$. To accomplish this we first differentiate partially with respect to a and set the result equal to 0, giving the first normal equation, and then do the same for b, giving the second normal equation.

Visits	*Sales*
0	10
1	12
2	13
3	15

We write the figures:

(1) x	(2) y	(3) x^2	(4) xy
0	10	0	0
1	12	1	12
2	13	4	26
3	15	9	45
6	50	14	83

Therefore:

$$\Sigma x = 6;\ \Sigma y = 50;\ \Sigma xy = 83;\ \Sigma x^2 = 14;\ N = 4$$

and the normal equations given above become:

$$50 = 4a + 6b$$
$$83 = 6a + 14b$$

It is now necessary to solve for a and b. Multiply the first equation by 3 and the second equation by 2 and get:

$$150 = 12a + 18b$$
$$166 = 12a + 28b$$

Subtract the first equation from the second and get:

$$16 = 10b$$
$$b = 1.6$$

Therefore: $50 = 4a + 9.6$ (from the first normal equation with 9.6 written in place of $6b$)

$$4a = 40.4$$
$$a = 10.1$$

Therefore, the equation of the least-squares regression line is:

$$y = 10.1 + 1.6x$$

CASES

CASE 15–1. DAVISON MANUFACTURING COMPANY

The Davison Manufacturing Company, manufacturers of electric light fixtures, operated under a standard cost accounting system. Labor data for the four production departments for the month of June (with numbers slightly rounded for ease of computation) were as follows:

Department	Direct Labor Cost		Hours of Direct Labor		Rate per Hour	
	Actual	Standard	Actual	Standard	Actual	Standard
A	556.80	561.00	480	510	1.16	1.10
B	1,248.20	1,312.00	790	820	1.58	1.60
C	1,038.50	975.00	670	650	1.55	1.50
D	1,277.10	1,274.00	990	980	1.29	1.30
	4,120.60	4,122.00	2,930	2,960		

Questions

1. Prepare a journal entry recording the direct labor cost. The company used an account called Work in Process, and direct labor was charged to this account at standard. The difference between actual cost and standard cost was carried to an account called Labor Variance.

2. For each department, determine how much of the difference between actual and standard cost was caused by differences between actual and standard hours and how much was caused by differences between actual and standard rates of pay.

3. What additional information, if any, would be required in order to understand the significance of the differences?

CASE 15–2. PROBLEMS IN THE ANALYSIS OF OVERHEAD COST

Problem A

The burden rate is \$2 per ton. Budgeted overhead cost at 3,000 tons per month is \$8,000 and at 7,000 tons is \$12,000. Actual overhead cost in September is \$11,000, and actual volume is 5,000 tons.

Required:

a) Show graphically absorbed costs and expected costs.
b) State the following:
Standard volume ____________
Budgeted nonvariable cost ____________
Budgeted variable cost per ton ____________
Costs absorbed in September ____________
Volume variance in September ____________
Spending variance in September ____________
Net variance in September ____________

Problem B

The formula for budgeted overhead costs is $y = \$5{,}000 + \$1$ per unit. Standard volume is 5,000 units per month. Actual overhead expense in March is \$13,000, and output in March is 7,000 units.

Required:

Standard volume ______________
Budgeted nonvariable cost ______________
Budgeted variable cost per unit ______________
Cost absorbed in March ______________
Volume variance in March ______________
Spending variance in March ______________
Net variance in March ______________

PROBLEM C

The forecast year's burden expense for an expected volume of 144,000 pounds of a product was as follows:

Nonvariable overhead	$36,000
Variable overhead	72,000

In May output was 10,000 pounds and actual overhead expense was $7,700. Determine (*a*) the budget line, (*b*) standard volume, (*c*) standard overhead per unit, and (*d*) the overhead variances.

PROBLEM D

In June overhead volume variance was 0 and "spending" variance was a debit of $600. In July overhead volume variance was a debit of $800, but "spending" variance was 0. June actual overhead expense was $7,000 for an output of 800 tons. July's expense was $5,600, and output was 600 tons. In August output was 900 tons, and actual overhead expense was $7,100. What was the budget figure for August? How much was absorbed in August? What can you say of variances for August?

PROBLEM E

Overhead was charged to product at 75 per cent of direct labor dollars. According to the budget, overhead should be $5,600 for a direct labor payroll of $8,000 and $6,800 for a direct labor payroll of $10,000. If actual overhead costs turned out to be $6,000 and $7,000, respectively, at these two volumes, what were the variances? What was standard volume for the company?

PROBLEM F

Department 12 of the Hudson Company manufactured rivets and no other products. All rivets were identical. In August, 1946, Department 12 made 4,000,000 rivets. The company used a standard cost system plus a variable budget for overhead expense. Standard unit overhead charges (i.e., standard unit costs for overhead) were determined by dividing budgeted costs at an expected average volume by the number of rivets (in thousands) which that volume level (i.e., rate of capacity) represented. Certain cost information is shown in the following table, and you are requested to fill in the blank spaces. The clue to the expected average volume necessary to fill in the blanks in line 3 can be found by a close analysis of the relationships among the figures given for allocated service and general overhead.

Dept. 12	Actual Cost, Aug., 1946	Std. Chg. per 1,000 Rivets	Total Std. Cost, Aug., 1946*	Overhead Budget, Aug., 1946	Overhead Budget Formula
Direct labor	$10,500	$3.00	$	Not used	
Direct material	22,000	5.00	20,000	" "	
Dept. direct overhead expense	9,500	...	.....	$ 9,200	$6,000 per month plus $0.80 per thous. rivets
Allocated service and general overhead	5,000	1.00	4,000	5,000	$5,000 per month
Total	$47,000	$...	$.....	$14,200	

* Standard charge per one thousand rivets times August, 1946, volume of 4,000,000 equals total standard cost.

Required:

1. Fill in the blanks.
2. What was the expected average volume (in terms of rivet output) at which the standard unit overhead charge was determined?
3. Explain as much of the difference between total actual costs and total standard costs as you can on the basis of the information given.

CASE 15–3. RETALLACK COMPANY

The Retallack Company manufactured pennants on a customer-order basis for local organizations such as schools, fraternities, and yacht clubs. Because there was considerable variation in the quantities ordered, the quality of material used, and in sizes and patterns, the company prepared a separate job cost sheet for each order.

Costs of materials and direct labor applicable to each order were recorded directly on the appropriate job cost sheet. Manufacturing burden was allocated to each order on the basis of a standard burden rate per unit. The standard burden rate was determined before the beginning of each year for each size of pennant by dividing the estimated burden costs for the coming year chargeable to that size by the number of units of that size that was expected to be sold. Burden costs were divided into two components, variable and fixed.

In December, 1954, the accountant was working out for the following year the burden rates to be applied per unit for each of the four different size pennants manufactured by the company. The number of each size pennant estimated to be sold in 1955 was as follows:

Size	*Estimated Quantity to Be Sold*
A	15,000
B	20,000
C	10,000
D	5,000
Total	50,000

Based on the sales forecast, the accountant estimated that the burden costs chargeable to each size pennant would probably be:

1955 Estimated Components of Burden Cost

Size	Fixed*	Variable (per Pennant)
A	$3,300	$0.08
B	4,000	0.06
C	1,500	0.05
D	850	0.03
Total	$9,650	

* Fixed burden costs, both estimated and actual, were allocated to each size of pennant on the basis of direct labor hours, raw material quantity, floor space required, and other reasonable bases of allocation.

Questions

1. From the data given, what is the estimated total burden cost per pennant (i.e., the standard burden rate) for each of the four sizes?

2. Using the standard burden rate found in Question 1, determine the burden variances attributable to volume and the variances attributable to "spending" or "efficiency" if the actual units produced and sold in 1955 and actual burden costs were as follows:

a) 15,000 units of size A produced and sold. Actual burden cost was $4,700.

b) 18,000 units of size B produced and sold. Actual burden cost was $5,080.

c) 9,000 units of size C produced and sold. Actual burden cost was $1,825.

d) 7,000 units of size D produced and 6,500 units sold. Actual burden cost was $975.

3. When the accountant calculated the burden per pennant to be allocated on customer orders for the following year, should he have included the fixed element of the burden?

CASE 15–4. KODAK PARK WORKS

Data for four departments taken from a cost report of the Kodak Park Works, Eastman Kodak Company, are shown as Exhibit 1. For control purposes the Eastman Kodak Company divided its operating year into thirteen four-week periods. Part A of Exhibit 1 is the report for the tenth of these periods, and Part B reports the cumulative experience of the first ten periods of the current year.

Questions

1. Describe, as completely as you can, the meaning of the figures shown in Exhibit 1 and the use that management can make of them.

2. What steps did the company probably go through to determine the figure of $8,000 that appears under the heading of "Burden: Volume" for Department G?

3. Which of the four departments apparently has the poorest performance?

Exhibit 1

KODAK PARK WORKS

A. Increase or Decrease over Standard Cost, Tenth Period

Department	Total Std. Cost	Material		Direct Labor	Burden		Waste†	Total Mfg. Variance
		Price	Yield, Usage and Formula		Volume	Budget Etc.		
Dept. E	$ 47,000	$ 500	$ 500	$ 600*	$ 400	$ 1,000*	$ 100*	$ 300*
Dept. F	60,000	500	500	600	400*	750*	100	550
Dept. G	64,800	4,000	15,000	1,500*	8,000	8,250*	6,000*	11,250
Dept. H	128,200	1,000	4,000	3,500*	12,000	8,000*	2,600	8,100
Total for Tenth period	$300,000	$ 6,000	$ 20,000	$ 5,000*	$20,000	$18,000*	$ 3,400*	$19,600

B. Increase or Decrease over Standard Cost, Year to Date

Department	Total Std. Cost	Material		Direct Labor	Burden		Waste†	Total Mfg. Variance
		Price	Yield, Usage and Formula		Volume	Budget Etc.		
Dept. E	$ 472,000	$	$ 9,000*	$ 1,000*	$ 4,400	$ 2,000*	$ 1,000*	$ 8,600*
Dept. F	605,000	.....	12,000	.....	.....	2,000	1,000	15,000
Dept. G	470,000	40,000*	60,000	4,000*	2,000*	10,000*	14,000*	10,000*
Dept. H	884,000	10,000*	37,000	10,000*	2,000*	20,000*	3,000*	8,000*
Total Year to Date	$2,431,000	$50,000*	$100,000	$15,000*	$ 400	$30,000*	$17,000*	$11,600*

* Increase.

† A standard amount of waste was established by the company reflecting expected spoilage or defective output. Waste is to be distinguished from "yield." Yield refers to the quantity of product obtained from the initial processing of a batch of raw material, whereas waste refers to spoilage or defects arising out of subsequent operations performed on the product.

Chapter

16

PERIOD PLANNING, OR BUDGETING

This and the two following chapters discuss the use of accounting information in the planning process. For our purposes, it is convenient to distinguish between two types of planning: period planning and project planning. *Period planning,* or budgeting, involves a projection of the over-all activity of the enterprise, in terms of costs and revenues, over a specified period of time in the future, usually one year. *Project planning* is the analysis that is made in order to reach a decision on a specific project or proposal and involves a consideration of how future costs and revenues will be affected over the whole life of the project. The two types of planning are interrelated since decisions on specific projects largely set the pattern of the over-all activity of the firm and hence influence its future costs and revenues. Period planning is discussed in this chapter, and project planning in Chapters 17 and 18.

THE BUDGET

All managements plan. One could not conceive of an organization of any kind whose leaders were not giving some thought to the organization's objectives and the best way of reaching those objectives. A group of people not operating under some sort of plan is merely an incoherent, directionless mob, not an organization.

Although all managements plan, there is great diversity in the way in which they plan. Some people do their planning entirely in their heads, others make notes and rough estimates on the backs of old envelopes, and still others commit their plans to paper in some orderly, systematic fashion. The process engaged in by the latter group is called "budgeting," for a *budget* is merely a written plan expressed in quantitative terms. We are here especially concerned with budgets that are expressed in monetary terms—costs and revenues—although some budgets are expressed in terms of units of product, number of employees, units of time, or in other nonmonetary terms.

Types of Budgets

There is a tremendous variation in the way in which budgets are prepared in different companies; in fact, the diversity in budgeting practice is much greater than the diversity of accounting practice. Nevertheless, it is safe to say that in a company that has a complete budgeting program, one would expect to find two types of budgets, a "program" budget and a "responsibility" budget. These represent two ways of depicting the over-all plan for the whole business—two different methods of slicing the pie; therefore, each arrives at the same figure for projected net profit.

The *program budget* sets forth plans in terms of the major "programs" the company plans to undertake. Such a budget, for example, might be arranged by products lines and show the anticipated revenue and costs associated with each product. This type of budget is useful in examining the over-all balance among the various programs of the business. It helps to answer such questions as: Is the profit margin on each product line satisfactory? Is production capacity in balance with the size and capability of the sales organization? Can we afford to spend so much for research? Are adequate funds available? And so on. A negative answer to any of these questions of course indicates the necessity for revising the plan.

The *responsibility budget* sets forth plans in terms of the persons responsible for carrying them out. It is therefore primarily a control device since it is a statement of expected or standard performance against which actual performance can later be compared. In the factory, for example, there may be a responsibility budget for each department, showing the costs that are controllable by the foreman of the department. There may also be a budget showing costs for each product, including both direct costs and allocated costs. The figures on both sets of budgets would add up to total factory costs, but the product-cost budget would not be useful for control purposes since the allocated costs shown on it could not be related to the responsibility of specific individuals.

Since it is likely that actual volume during a period will be different from expected or budgeted volume, and since costs vary significantly with volume, a budget is often prepared for each responsibility center showing the expected behavior of costs at various volume levels. This is called a *variable budget.* Methods of estimating costs at various volumes have been described in Chapter 15, and the total costs estimated at various volumes on this budget correspond to the budgeted cost line in the diagrams given in that chapter. The figure used in estimating the over-all profit for the company is one figure from the variable budget, namely, the cost at the planned volume of activity.

The Budget Process

The process of preparing the budget can be studied both as an accounting process and as a management process. From an accounting standpoint, the procedures are essentially the same as those described in earlier chapters, and the end result of the recording and summarizing operations is a set of financial statements—a balance sheet and income statement—identical in format with those resulting from the process of recording historical events. The only difference is that the budget figures are estimates of what will happen in the future rather than historical records of what has happened in past. As a matter of fact, some of the cases in the early chapters dealt with future rather than past events, and the balance sheets and income statements prepared in connection with these cases were budgets.

From a management standpoint, the budgeting process is so closely associated with the operation of the business that a complete description of the factors and considerations involved would take us far beyond the scope of this book. Rather than attempt such a description, we shall merely indicate the steps that often are followed in preparing a budget.

Most companies that prepare budgets do so annually. Some companies prepare, in addition to the annual budget, a less detailed projection of costs and revenue for 5, 10, or even 20 years in the future. Even though the budget is basically prepared once a year, it may be revised at more frequent intervals, either at regular times, such as each quarter, or whenever significant changes in cost or revenue factors occur. Assuming that the budget is to be prepared for a year beginning next January 1, the budget timetable might be somewhat as follows:

October 15. Management sets tentative objectives and guide lines for the coming year. These are based on forecasts of market conditions, prices, costs, capacity, and other factors, perhaps as prepared by a separate planning staff. In the absence of indications to the contrary, it is customary to assume that next year will be similar to this year. These approved guide lines are transmitted down through all levels in the organization.

October 15–November 15. Responsible supervisors at the lowest level in the organization prepare estimates of the items for which they are responsible, based on these guide lines. These are discussed with and approved by their immediate superior, are combined by him with similar estimates from other supervisors, and thus are transmitted upward through the organization. Accounting or other staff people assist the supervisors in this work by making detailed calculations, by providing historical data, and by summarizing and recording the estimates; but the line supervisors, not the accountants, make the decision. The importance of having budget decisions made by the supervisors themselves is, as explained in Chapter 15, that unless they do accept the responsibility for the reasonableness of the budget figures, they usually are unwilling to accept a later comparison of budget and actual results as being a valid measure of their performance.

November 15–December 15. The budget estimates are considered by top management. Responsibility budgets that have flowed up from the organization are recombined into program budgets, and these are examined for over-all balance, feasibility, and desirability as described above. This examination may indicate the need for revision, and such revisions are made after discussion with the persons affected.

December 15. Top management (usually the board of directors) approves the budget, and the approved budget is transmitted to the organization. As described in Chapter 15, the approved budget is a device for communicating to the organization approved objectives and means of reaching these objectives.

The foregoing is not intended as being a model but only as suggestive of the steps involved. In the federal government, for example, the process of preparing an annual budget stretches out over approximately fifteen months, although this long-time span is largely a result of the antiquated procedures that are used rather than of inherent difficulties. At the other extreme, a small business may complete the whole process in one afternoon.

An Illustration—The Flight Plan

Rather than attempting to illustrate the budget process by showing all the figures that would be prepared in an actual company, we shall refer to the flight plan that is prepared for each airplane flight. In most essential respects, a flight plan is similar to the financial budget in a company, but it relates to a business operation that is started and finished in a matter of hours. A flight for American Airlines Flight 14 is shown in Illustration 16–1. American Airlines has stated in its advertisements: "For your safety, we fly every mile on paper before we fly it in the air," which is an excellent description of the basic reason for preparing a budget. Some of the things that should be noted about this flight plan are:

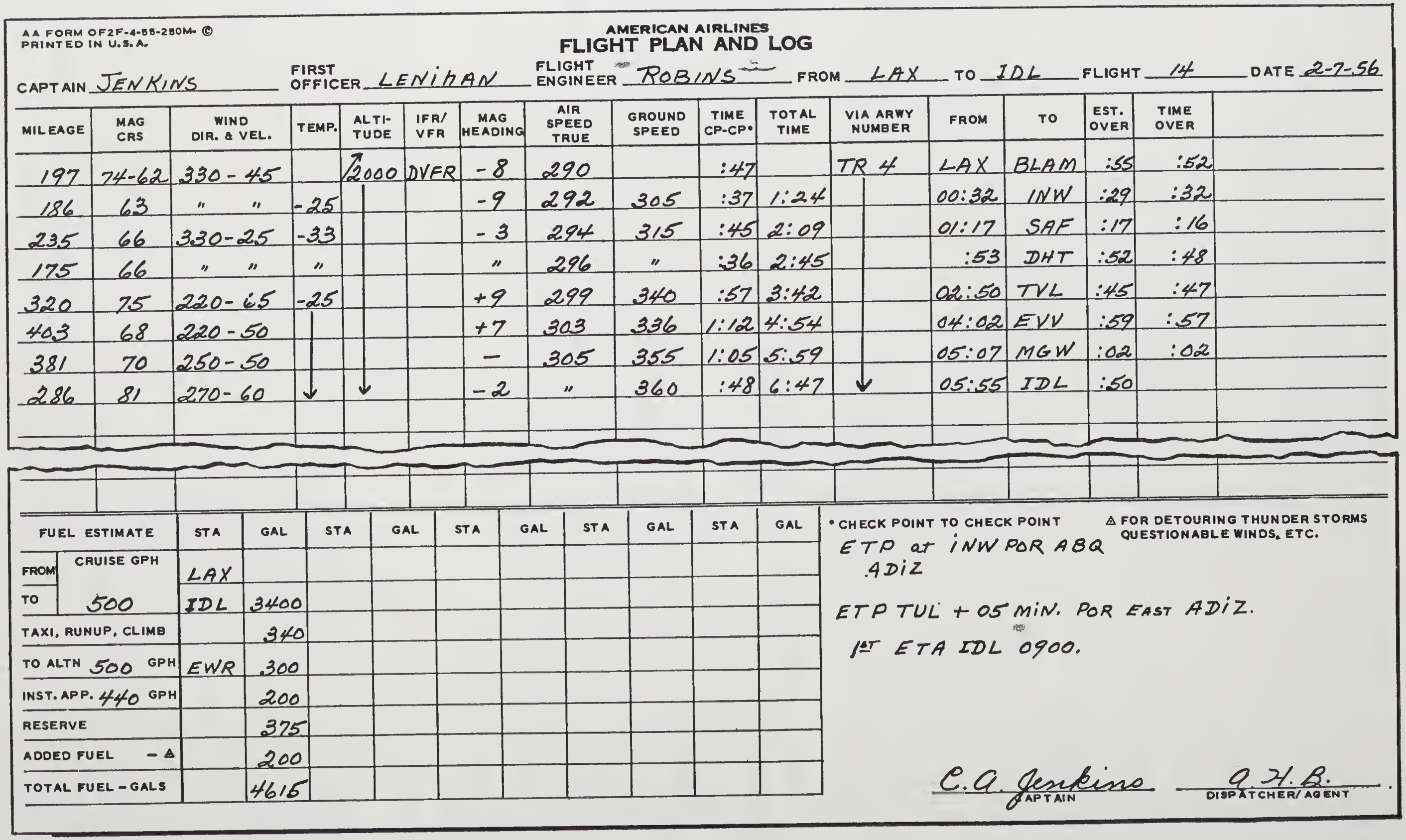
1. The flight plan is a written document. It is prepared in advance by Captain Jenkins, the person who is responsible for the flight.
2. It is prepared within the framework of decisions made by higher authority. Among these decisions are: the objective is to be IDL (Idlewild); the plane is to be of a specified type; and the crew is to consist of the captain, the first officer, and the flight engineer.
3. The captain describes how he plans to reach the objective (i.e., his altitude and route) and the estimated cost (in terms of gasoline consumption and time) of doing so. In making his plan, he has taken account of forecasts of wind and weather that affect the way he reaches the objective, and in view of these conditions he works out what seems to him to be the best way of getting to Idlewild.
4. The meteorologist, a staff man, has furnished information that helps the captain to plan, but the captain, not the staff man, is responsible for the plan.
5. The captain signs the plan, indicating that he accepts responsibility for it.
6. The dispatcher initials the plan, indicating that he approves it, and that management will support and back the captain if he operates according to plan.
7. It should be noted that the plan itself does not fly the plane. Similarly, the budget is an aid to management, not a substitute for management.

The planning and control processes are closely connected. The control information that was collected for Flight 14 is shown on the last two columns of Illustration 16–1. This part of the form is called a flight log, and it corresponds to the historical accounting reports that have been discussed in previous chapters. It gives a record of actual performance in terms of the time actually taken between each check point. In the bottom right-hand corner, the pilot explains significant differences between actual and planned performance. (The explanations are of course cryptic to the layman, but they need not be translated for our purpose.) If there are no differences or if the differences are explainable in terms of noncontrollable factors, such as the wind or weather, he cannot be criticized; otherwise he is legitimately subject to criticism.

Note that the flight log does not show all aspects of the flight, but only those that are reduced to quantitative terms. It does not show, for example, whether the passengers were jounced around or whether the captain almost missed the runway. The factors not shown may be more important than the factors that are shown. The report is therefore not a *complete* record of performance.

A plane is a responsibility center, and the duration of a flight is an "accounting period." Each of the points that have been noted above about the Flight Plan apply equally well to the preparation and use of a budget in a business. The business budget differs from that shown in Illustration 16–1 in that the figures are shown in dollar terms, and the budgeting process in a business is complicated both by the necessity of

Illustration 16-1



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AMERICAN AIRLINES
FLIGHT PLAN AND LOG

CAPTAIN JENKINS FIRST OFFICER LENIhAN FLIGHT ENGINEER ROBINS FROM LAX TO IDL FLIGHT 14 DATE 2-7-56

MILEAGE	MAG CRS	WIND DIR. & VEL.	TEMP.	ALTITUDE	IFR/VFR	MAG HEADING	AIR SPEED TRUE	GROUND SPEED	TIME CP-CP*	TOTAL TIME	VIA ARWY NUMBER	FROM	TO	EST. OVER	TIME OVER	
197	74-62	330 - 45		↗2000	DVFR	-8	290		:47		TR 4	LAX	BLAM	:55	:52	
186	63	" "	-25	│		-9	292	305	:37	1:24	│	00:32	INW	:29	:32	
235	66	330-25	-33	│		-3	294	315	:45	2:09	│	01:17	SAF	:17	:16	
175	66	" "	"	│		"	296	"	:36	2:45	│	:53	DHT	:52	:48	
320	75	220-65	-25	│		+9	299	340	:57	3:42	│	02:50	TVL	:45	:47	
403	68	220-50	│	│		+7	303	336	1:12	4:54	│	04:02	EVV	:59	:57	
381	70	250-50	│	│		—	305	355	1:05	5:59	│	05:07	MGW	:02	:02	
286	81	270-60	↓	↓		-2	"	360	:48	6:47	↓	05:55	IDL	:50		

FUEL ESTIMATE		STA	GAL	STA	GAL	STA	GAL	STA	GAL	STA	GAL
FROM	CRUISE GPH	LAX									
TO	500	IDL	3400								
TAXI, RUNUP, CLIMB			340								
TO ALTN 500 GPH		EWR	300								
INST. APP. 440 GPH			200								
RESERVE			375								
ADDED FUEL — △			200								
TOTAL FUEL – GALS			4615								

* CHECK POINT TO CHECK POINT

△ FOR DETOURING THUNDER STORMS QUESTIONABLE WINDS, ETC.

ETP at INW POR ABQ
ADIZ

ETP TUL + 05 MIN. POR EAST ADIZ.

1ST ETA IDL 0900.

C.A. Jenkins
CAPTAIN

A.H.B.
DISPATCHER/AGENT

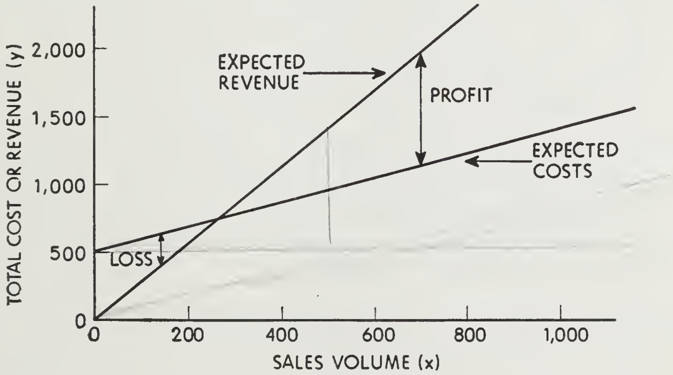
fitting many individual segments (e.g., departments) into a plan that is satisfactory for the company as a whole and by the fact that future events that affect the progress of a business toward its objective are likely to be much less certain than those that affect the flight of a plane.

BREAK-EVEN CHART

In Chapter 15, methods of analyzing the expected relationship of cost and volume were described. These methods are used as part of the planning process. The *break-even chart,* which is another device widely used for planning purposes, is an extension of these same techniques. A break-even chart is simply a diagram showing the expected relationship between cost and *revenue* at various volumes.

Volume is often expressed in terms of sales revenue. The cost line on such a chart has the same general shape as the cost line shown in Illustration 15–8. It shows the *total* cost expected at any volume and therefore differs from the line in Illustration 15–8, which showed only overhead costs. Since both the y and x axes on the chart express sales revenue, the revenue line is simply the line $y = x$; that is, a line starting at 0, the origin, and going up at an amount proportional to volume. A break-even chart is shown in Illustration 16–2. At the *break-even volume,* cost equals revenue. At lower volumes, a loss is incurred, and at higher volumes a profit is earned. The amount of loss or profit expected at any volume is the difference between points on the cost and revenue lines at that volume.

Illustration 16–2



The break-even volume should not be confused with the "normal" volume used as a basis for determining the burden rate. In a profitable business, normal volume is considerably higher than the break-even volume.

Construction of a Break-Even Chart

If volume (the x axis) is expressed in terms of sales revenue, the revenue line on a break-even chart is the straight line $y = x$, as described above. If volume is expressed by some other measuring stick, such as number of units sold, revenue at any volume is the number of units represented by that volume multiplied by an average selling price per unit. Designating the unit price as p, the formula for the revenue line is $y = px$. Sometimes several revenue lines are drawn on a break-even chart, showing what revenue would be at several different prices. This helps to show how a change in selling price affects the profit at any volume.

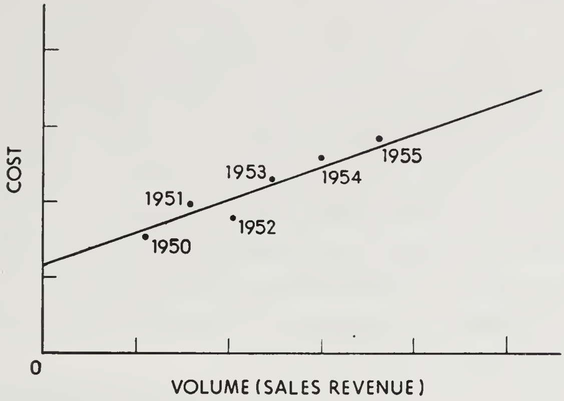
The cost line may be drawn by any of the methods for finding budgeted costs that were described in Chapter 15. Perhaps the method most commonly used is that of preparing a scatter diagram of the historical relationship of costs and sales volume. Such a diagram is easy to prepare but tricky to interpret. A break-even chart is supposed to show the relationship between cost and revenue under a *single set of conditions.* The cost-revenue relationships of prior periods reflect the conditions existing in those periods, however, and such conditions may change significantly with the passage of time.

In particular, such a scatter diagram may be influenced by the condition called "drift," which is illustrated in Illustration 16–3. This is a scatter diagram of cost-volume relationships for six years. The dots lie along a well-defined path, which is indicated by the straight line, but this line may *not* indicate the present relationship between cost and volume. It may, instead, indicate nothing more than the tendency for both revenue and cost to increase over the past six years because of inflationary factors. If this is the case, then the line shows the trend, or drift, of costs *through time,* not the probable relationship between cost and volume *at a given time.* Any scatter diagram covering a period of years in which sales were generally increasing each year, or generally decreasing each year, is likely to have this characteristic, and the longer the period covered, the more unreliable the chart becomes.

If, in order to avoid this difficulty, the figures for only the most recent years are plotted on the diagram, there may not be enough difference in the volumes of the several periods to obtain a satisfactory line of relationship. The choice of a series of observations that are recent enough so that they do not reflect an obsolete set of conditions,

Illustration 16–3

SCATTER DIAGRAM, ILLUSTRATING DRIFT



yet which cover a wide enough volume range to permit the drawing of a satisfactory line, is a difficult matter.

Sometimes, attempts are made to adjust, or "deflate," historical observations to allow for changes in price and other factors. Techniques for doing this are outside the scope of this book.

Interpretation of the Break-Even Chart

The break-even chart is a useful device for analyzing the over-all profit characteristics of a business. To illustrate, assume the following situation:

Nonvariable costs	$500
Variable costs	$1 per unit
Normal volume	1,000 units
Selling price	$2 per unit

In this situation, total costs at normal volume will be $500 (nonvariable) plus $1,000 (variable), or $1,500. The "cost" of the product as shown on the accounting records will therefore be $1,500 ÷ 1,000 units, or $1.50 per unit. At a selling price of $2.00, the normal profit will be $0.50 per unit.

Recall that the break-even volume is the volume at which cost equals revenue.

Revenue (y) at any volume (x) is: $y = px$
Cost y at any volume (x) is: $y = a + bx$
The break-even volume is therefore: $px = a + bx$

Or, if we let x equal the break-even volume, then for the above situation, we have

$$\$2x = \$500 + \$1x$$
$$x = 500 \text{ units}$$

In other words, at the break-even volume, revenue equals 500 units times \$2, and cost equals \$500 + (500 units times \$1), both of which equal \$1,000.

From these relationships, an important conclusion can be drawn: although the normal profit is \$0.50 per unit, this rate of profit will be earned *only* at the normal volume. At lower volumes the profit will be less than \$0.50 per unit, and at higher volumes it will be more than \$0.50 per unit. The relationship between cost, revenue, and volume can be summed up by the statement that for each change of one unit in volume, profit will change by \$1.00, which is the *marginal income,* the difference between selling price and *variable cost.* Below the break-even point losses will be incurred at the rate of \$1.00 for each unit that volume drops below break-even volume.

Note also that the break-even volume is determined by the relationship between nonvariable costs and marginal income. In the illustrative situation, where the marginal income is \$1.00 and nonvariable costs are \$500, 500 units must be sold before enough income can be earned to cover nonvariable costs. After that, a profit of \$1.00 per unit will be earned.

These relationships suggest that a useful way of studying the profit factors of a business is to consider not the normal profit per unit but rather the nonvariable costs and the marginal income, which is the difference between selling price and marginal cost. In these terms, there are four ways in which the profit of a business can be increased:

1. Decrease nonvariable costs
2. Increase selling prices per unit
3. Decrease variable costs per unit
4. Increase volume

Since these factors are interdependent, they cannot be considered separately. For example, an increase in selling price may result in a decrease in volume. Nevertheless, an analysis of these four factors is often a useful way of attacking the problem of planning the optimum profit of a business.

CASES

CASE 16–1. REED PAINT COMPANY

In August, 1939, C. H. Macrae was elected president of the Reed Paint Company to fill the vacancy created by the retirement from active business life of the former chief executive. Mr. Macrae had been with the company for fifteen years, and for the preceding six years he had been vice-president in charge of manufacturing. Shortly after taking over his new position, Mr. Macrae held a series of conferences with the controller in which the general subject under discussion was budgetary control technique. The new president thought that the existing method of planning and checking on selling costs was particularly unsatisfactory, and he requested the controller to devise a system which would provide better control over these costs.

The Reed Paint Company manufactured a complete line of paints which it sold through branch offices to wholesalers, retailers, builders, and industrial users. Most of the products carried the Reed brand name, which was nationally advertised. The company was one of the largest in the industry.

Current Procedure

Under the procedure then being used, selling expenses were budgeted on a "fixed" or "appropriation" basis. Each October the accounting department sent to branch managers and to the other executives in charge of selling departments a detailed record of the actual expenses of their departments for the preceding year and for the current year to date. Guided by this record, by estimates of the succeeding year's sales, and by his own judgment, each department head drew up and submitted an estimate of the expenses of his department for the succeeding year, detailed as to main items of expense. The estimates made by the branch managers were sent to the sales manager, who was in charge of all branch sales. He determined whether or not they were reasonable and cleared up any questionable items by correspondence. Upon approval by the sales manager, the estimates of branch expenses were submitted to the manager of distribution, Mr. Campbell, who was in charge of all selling, promotional, and warehousing activities.

The manager of distribution discussed these figures and the expense estimates furnished by the other department heads with the executives concerned, and after differences were reconciled, he combined the estimates of all the selling departments into a selling expense budget. This budget was submitted to the budget committee for final approval. For control purposes, the annual budget was divided into twelve equal amounts, and actual expenses were compared each month with the budgeted figures. Exhibit 1 shows the form in which these monthly comparisons were made.

Mr. Macrae believed that there were two important weaknesses in this method of setting the selling expense budget:

1. It was impossible for anyone to ascertain with any feeling of certainty the reasonableness of the estimates made by the various department heads. Clearly, the expenses of the preceding year did not constitute adequate standards against which these expense estimates could be judged, since selling conditions were never the same in two different years. One obvious cause of variation in selling expenses was the variation in the "job to be done," as defined in the sales budget.

Exhibit 1

REED PAINT COMPANY

Budget Report—Used in 1939

Branch Sales and Expense Performance

date: October, 1939 | branch a | Mgr: H. C. Obermeyer

	This Month				Over*—Under Year to to Date
	Budget†	Actual	Over* Under	Percentage of Sales	
Net sales	190,000	160,000			
Executive salaries	2,000	2,000	....	1.25	....
Office salaries	1,150	1,134	16	0.71	1,203
Salesman's compensation	11,400	9,600	1,800	6.00	2,802*
Travelling expense	3,420	3,127	293	1.95	1,012*
Stationery, office supplies, and expense	1,042	890	152	0.56	360
Postage	230	262	32*	0.16	21
Light and heat	134	87	47	0.05	128
Subscriptions and dues	150	112	38	0.07	26
Donations	125	....	125	0.00	130
Advertising expense (local)	1,900	1,800	100	1.12	1,200*
Social security taxes	291	205	86	0.13	27*
Rental	975	975	....	0.61	....
Depreciation	762	762	....	0.48	....
Other branch expense	2,551	2,426	125	1.52	247*
TOTAL	26,130	23,380	2,750	14.61	3,420*

† 1/12 of 1939 budget.

2. Selling conditions often changed substantially after the budget was adopted, but there was no provision for making the proper corresponding changes in the selling expense budget. Neither was there a logical basis for relating selling expenses to the actual sales volume obtained or to any other measure of sales effort. The chief executive believed that it was reasonable to expect that sales expenses would increase, though not proportionately, if actual sales volume were greater than the forecasted volume; but that with the existing method of con-

trol it was impossible to determine how large the increase in expenses should be.

Proposed Procedure

As a means of overcoming these weaknesses the president suggested the possibility of setting selling cost budget standards on a fixed and variable basis, a method similar to the techniques used in the control of manufacturing expenses. The controller agreed that this manner of approach seemed to offer the most feasible solution to the problem, and he therefore undertook, with the co-operation of the sales department, a study of selling expenses for the purpose of devising a method of setting reasonable standards. In recent years, the accounting department had made many analyses of selling costs, the results of which had been used in determining the proper bases for allocating costs to products, customers, functions, and territories. These studies were also used in the solution of certain special problems, such as the problem of determining how large an individual order had to be in order to be profitable to the company. Many of the data which had been accumulated for these purposes were helpful in the controller's current study.

The controller was convinced that the fixed portion of selling expenses—in other words, the portion which was independent of any fluctuation in volume—could be established by determining the amount of expenses which had to be incurred at the minimum sales volume at which the company was likely to operate. He therefore asked Mr. Campbell, the manager of distribution, to suggest a minimum volume figure and the amount of expenses which would have to be incurred at this volume level. A staff assistant was assigned the task of studying the past sales records of the company over several business cycles, the long-term outlook for sales, and sales trends in other companies in the industry. From the report prepared by his assistant, Mr. Campbell concluded that sales volume would not drop below 45 per cent of the current capacity of the factory.

Mr. Campbell then attempted to determine the selling expenses which would be incurred at the minimum volume. With the help of his staff assistant, he worked out a hypothetical selling organization which in his opinion would be required to sell merchandise equivalent to 45 per cent of factory capacity, complete as to the number of persons needed to staff each branch office and the other selling departments, including the advertising, merchandise, and sales administration departments. Using current salary and commission figures, the assistant calculated the amount of money which would be required to pay salaries for such an organization. The manager of distribution also estimated the other expenses, such as advertising, branch office upkeep, supplies, and travel, which he thought would be incurred by each branch and staff department at the minimum sales volume.

The controller decided that the variable portion of the selling expense standard should be expressed as a certain amount per sales dollar. He realized that the use of the sales dollar as a measuring stick had certain disadvantages in that it would not reflect such important influences on costs as the size of the order, the selling difficulty of certain territories, changes in buyer psychology, etc. The sales dollar, however, was the measuring stick most convenient to use, the only figure readily available from the records then being kept, and also a figure which all the individuals concerned thoroughly understood. The controller believed that a budget which varied with sales would certainly be better than a budget which did not vary at all. He planned to devise a more accurate measure of causes of variation in selling expenses after he had had an opportunity to study the nature of these factors over a longer period of time.

As a basis for setting the initial variable expense standards, the controller prepared a series of charts on which the actual annual expenditures for the principal groups of expense items for several preceding years were correlated with sales volume for the year. Using these charts, which showed to what extent the principal expense items had fluctuated with sales volume in the past, and modifying them in accordance with his own judgment, the controller determined a rate of variation for the variable portion of each item of selling expense. The controller thought that after the new system had been tested in practice, it would be possible to refine these rates, perhaps by the use of a technique analogous to the time-study technique employed to determine certain expense standards in the factory.

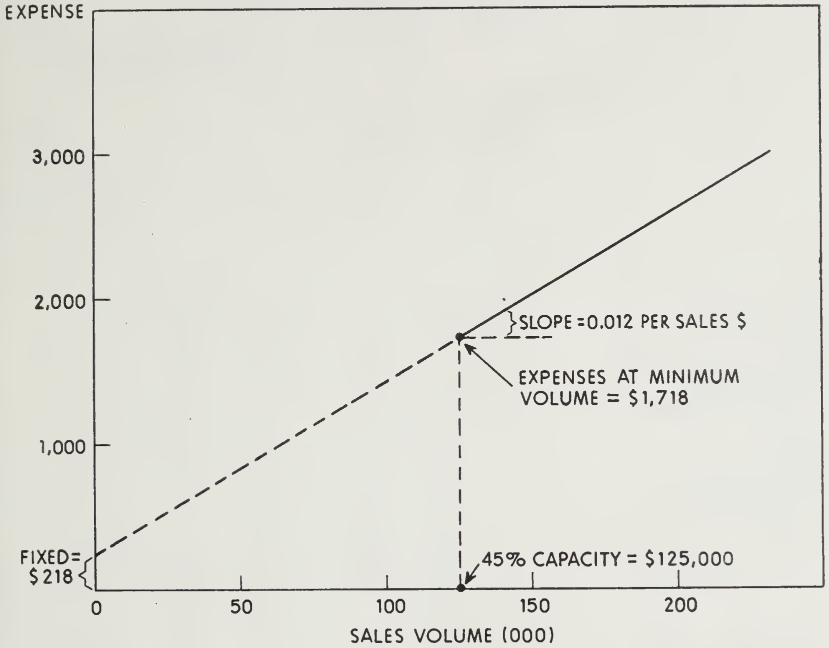
At this point the controller had both a rate of variation and one point (i.e., at 45 per cent capacity) on the selling expense curve for each expense item. He was therefore able to construct a formula for each item by extending a line through the known point at the slope represented by the rate of variation. He determined the height of this line at zero volume and called this amount the fixed portion of the selling expense formula. The diagram in Exhibit 2 illustrates the procedure, although the actual computations were mathematical rather than graphic.

The selling expense budget for 1940 was determined by adding to

Exhibit 2

REED PAINT COMPANY

Budget for "Other Branch Expense," Branch A



the new standards for the various fixed components the indicated flexible allowances for the 1940 estimated sales volume. This budget was submitted to the budget committee, which studied the fixed amounts and the variable rates underlying the final figures, making only minor changes before passing final approval.

The controller planned to issue each month reports showing for each department actual expenses compared with budgeted expenses. The variable portion of the budgeted allowances would be adjusted to correspond to the actual volume of sales obtained during the month. Exhibit 3 shows the budget report which he planned to send to branch managers.

One sales executive privately belittled the controller's proposal. "Anyone in the selling game," he asserted, "knows that sometimes customers fall all over each other in their hurry to buy, and other times, no matter what we do, they won't even nibble. It's a waste of time to make fancy formulas for selling cost budgets under conditions like that."

Exhibit 3

REED PAINT COMPANY

Budget Report Proposed by Controller

Expense Budget Report

branch: A
manager: H. C. Obermeyer
date: October, 1939

	Budget Factors		This Month			Year to Date
	Fixed	Variable	Budget	Actual	Over* Under	Over* Under
Net sales				160,000		†
Executive salaries	2,000	....	2,000	2,000	...	
Office salaries	110	0.0051	926	1,134	208*	
Salesman's compensation	....	0.0600	9,600	9,600	...	
Traveling expense	568	0.0142	2,840	3,127	287*	
Stationery, office supplies, and expense	282	0.0042	954	890	64	
Postage	47	0.0010	207	262	55*	
Light and heat	134	.....	134	87	47	
Subscriptions and dues	10	0.0008	138	112	26	
Donations	20	0.0005	100	....	100	
Advertising expense (local)	150	0.0100	1,750	1,800	50*	
Social security taxes	42	0.0013	250	205	45	
Rental	975	.....	975	975	...	
Depreciation	762	.....	762	762	...	
Other branch expense	218	0.0120	2,138	2,426	288*	
TOTAL	5,318	0.1091	22,774	23,380	606*	

† The controller had not recalculated budgets for previous months, and figures were therefore not available for this column.

Questions

1. From the information given in Exhibits 1 and 3, determine, insofar as you can, whether each item of expense is (*a*) nonvariable, (*b*) partly variable with sales volume, (*c*) variable with sales volume, or (*d*) variable with some other factor.

2. What bearing do your conclusions in Question 1 have on the type of budget that is most appropriate?

3. Should the proposed sales expense budget be adopted?

4. If a variable budget is used, should dollar sales be used as the measure of variation?

CASE 16–2. WILMOT SHOE COMPANY

Early in January, 1948, the treasurer of the Wilmot Shoe Company realized that the time of year was approaching when the company usually faced a seasonal shortage of funds. He therefore asked the con-

Exhibit 1

WILMOT SHOE COMPANY

Expected Cash Position, January–June, 1948

	January	February	March	April	May	June	Total
0. Shipments, in pairs, Grade A	14,000	18,750	27,500	23,250	15,250	13,000	
Grade B	20,400	29,250	41,400	36,450	23,700	20,000	
1. Sales, *previous* month, net	$120,158	$160,724	$222,891	$320,969	$277,100	$180,930	
2. Percentage of receivables collected	106%	97%	76%	85%	96%	115%	
3. Collection on receivables	$	$	$	$	$	$	$ . . . .
4. Other income	2,927	1,816	2,387	102	102	1,632	8,966
Total Receipts							
5. Material and labor							
6. Factory overhead at std.							
7. Factory overhead variance	$ 3,578	$ 2,716	$ 1,109	$ 1,904	$ 3,185	$ 3,942	$ 16,434
8. Commissions							
9. Other selling, general adm. expense	17,333	16,986	16,864	16,700	17,210	17,151	102,244
10. Federal tax			10,200			10,200	20,400
11. Bond interest		1,913					1,913
Total Disbursements							
12. Month's balance							
13. Cash, January 1, 1948	$ 33,497						
14. Cumulative balance, end of month							
15. Borrow							
16. Interest on loan							
17. Repay							
18. Cum. E.O.M. balance after financing							

Footnotes to Exhibit 1

Line

0. Forecasted shipments in pairs to be made during the month.

1. Figures in the "January" column are actual shipments for December. The "February" column shows forecasted shipments for January, etc. All figures are in dollars and are net after estimated returns and allowances. Terms are net 30 days.

2, 3. In January collections were expected to run at 106 per cent of shipments made in December; in February, 97 per cent of shipments made in January, etc.

4. Rent and repayments of officers' notes.

5. Unit cost of Style A is $4.18; unit cost of Style B is $1.86. The same number are produced as shipped each month.

6. At $0.24 per pair produced. No depreciation is included in this item or, in fact, in any of the figures. Depreciation was small and was charged as a separate item on the income statement.

Line

7. As worked out in a production budget which is not shown. All variances are credit, i.e., favorable, variances.

8. Commissions were 6 per cent of sales for the current month. June sales, $181,000.

9. Taken from a budgeted income statement which is not shown.

10. Based on income for 1947.

11. Semiannual interest on mortgage bonds outstanding.

12. The difference between receipts and disbursements for the month.

14. Without additional financing.

15. The company had a credit line of $150,000 with its bank. It usually borrowed and repayed in multiples of $5,000. The treasurer set the minimum cash balance at $20,000.

16. At the rate of 5 per cent per annum, payable monthly in advance.

troller to prepare a cash budget, giving itemized estimated receipts and disbursements for the next six months, together with a schedule showing suggested borrowings and repayments.

The company manufactured two grades of shoes. The shoes in each grade varied considerably as to style and color, but the unit costs for all shoes in each grade were approximately equal. Collections were good in January after the fall season, but later, as retailers stocked for the spring season, collections lagged. Expenses for these months, however, were larger than average since early spring was always a period of heavy production.

The form of cash budget usually employed by the Wilmot treasurer is partially filled out in Exhibit 1.

Questions

1. Complete the cash budget through line 12, using the information given in the footnotes.
2. Complete the rest of the budget, suggesting the timing and amount of schedule of borrowings and repayments.
3. List the principal factors that may result in a difference between your forecast and the actual receipts and disbursements.

CASE 16–3. REISSON COMPANY

In early 1952 Mr. Gerald Driscoll, statistician for the Reisson Company, was asked by top management to make a study of the increasingly unsatisfactory operating results of the company and to present to management proposals for remedying the situation based on his findings.

The Reisson Company manufactured home appliances. The four basic models of the company's product sold for $95, $100, $105, and $110 net to the company.

Mr. Driscoll decided to proceed with his investigation in two steps. First, he would make a preliminary investigation of the accounting records to see if he could find any significant relationships existing among the cost and revenue figures. He would then make a more intensive study, if warranted, along the lines indicated by the results of his preliminary study.

The operating data Mr. Driscoll initially collected from the accounting department are presented in Exhibit 1. The figures from 1949 through 1951 are broken down by months. It should be noted that the Reisson Company had an annual two-week vacation shutdown in July.

In his preliminary study, Mr. Driscoll experimented with several cost, revenue, and volume relationships before discovering leads indi-

Exhibit 1

REISSON COMPANY

Condensed Operating Data Three Years by Months

Year	Month	Sales Units	Sales Dollars (Thousands)	Percentage Return on Sales (before Taxes)	Profit or Loss (before Taxes) (Thousands)	Total Costs (Thousands)
1949	1	4,400	$452	7.45%	$34	$418
	2	3,500	346	1.00*	3*	349
	3	2,200	240	3.10*	7*	247
	4	2,000	220	4.18*	9*	229
	5	1,700	176	9.65*	17*	193
	6	3,300	347	5.78	20	327
	7	2,800	280	0.20	1	279
	8	3,800	386	6.01	23	363
	9	3,700	378	6.40	24	354
	10	3,300	332	1.20	4	328
	11	3,700	377	8.20	31	346
	12	3,800	380	3.10	12	368
1950	13	5,400	550	8.00	44	506
	14	5,600	567	8.80	50	517
	15	4,000	410	7.40	30	380
	16	5,200	538	9.00	48	490
	17	4,700	484	6.60	32	452
	18	3,500	377	6.00	23	354
	19	2,600	253	8.85*	22*	275
	20	5,100	510	7.40	38	472
	21	3,900	406	4.45	18	388
	22	3,700	391	5.10	20	371
	23	4,000	416	6.00	25	391
	24	5,800	600	9.80	59	541
1951	25	5,100	524	6.75	35	489
	26	5,000	511	5.70	29	482
	27	4,100	429	2.80	12	417
	28	4,300	435	3.40	15	420
	29	4,700	488	5.40	26	462
	30	4,500	464	5.30	25	439
	31	3,100	318	4.66*	15*	333
	32	3,700	385	2.60	10	375
	33	4,400	463	4.30	20	443
	34	4,200	430	3.90	17	413
	35	4,600	476	3.10	15	461
	36	4,300	444	2.10	9	435

* Indicates loss.

cating a need for further investigation. As an example of comparisons that yielded no worth-while results, scatter charts of sales prices compared to unit costs, and sales prices with volumes, showed only random fluctuations. Sales prices typically showed a decline in late 1949, a substantial recovery due to the Korean conflict in 1950, and fairly uniform averages in 1951 when government price controls were reinstituted. There was no evidence that sales were influenced by a seasonal factor.

Mr. Driscoll also compared percentage return before taxes (i.e., profit) on sales with volume. This comparison, shown on a scatter chart in Exhibit 2, indicated a tendency for the percentage returns on sales to rise with a higher volume. This apparent relation, in Mr. Driscoll's opinion, warranted further study. Mr. Driscoll, accordingly, applied the method of least squares to determine the average relationship between percentage return on sales and volume for the thirty-six months in 1949, 1950, and 1951. The equation of this relationship, in which x represents sales units and y represents percentage return on sales, was calculated to be $y = -12.333 + 0.004x$. This equation states that when the number of units sold changes by one unit, the percentage return on sales changes in the same direction by 0.004 per cent. The change in the number of units sold required to bring about a 1 per cent change in the percentage return on sales is, therefore, $1 \div 0.004$, or 250 units. This relationship was shown by the straight line drawn on Exhibit 2.

To determine the break-even volume; that is, the number of units that had to be sold in order for the company to break even (no profit or loss), Mr. Driscoll equated y to zero and solved for x (the number of units sold). The break-even volume was calculated to be 3,084 units, the value of x which satisfies the relations $0 = -12.333 + 0.004x$.

As a result of his preliminary investigation, Mr. Driscoll decided to direct his efforts toward an intensive study of fixed and variable costs. He therefore proceeded to classify the various cost accounts into two categories: (1) period costs and (2) variable costs.

Period costs included all or part of the following items:

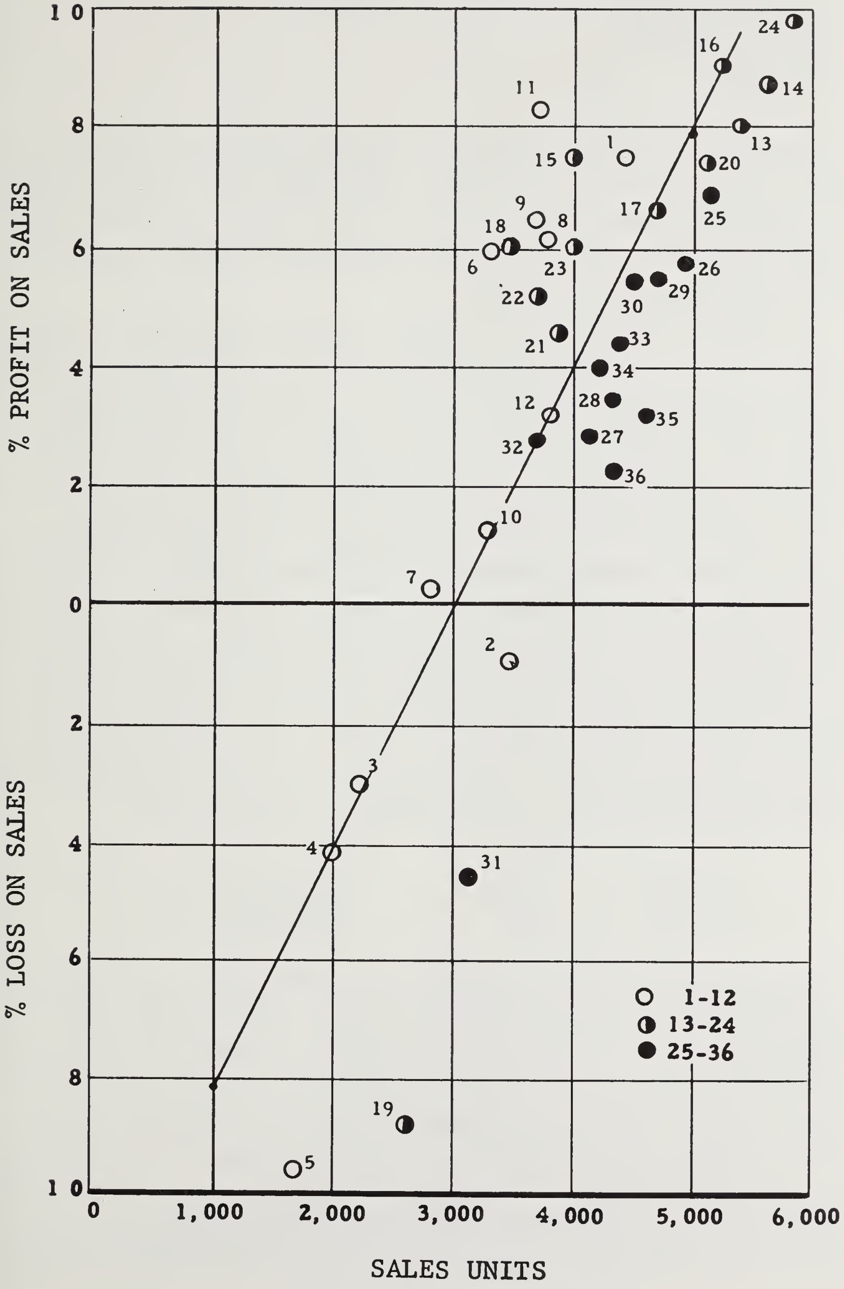
General and administration salaries
Miscellaneous salaries and wages
Payroll taxes on applicable payroll
Pension, compensation, welfare, or group insurance
Dues and donations
Depreciation and amortization
Telephone and telegraph and teletype
Selling salaries
Vacation and holiday pay

Exhibit 2

REISSON COMPANY

Three Years by Months

PROFIT OR LOSS AS PERCENTAGE OF SALES DOLLARS
COMPARED TO SALES UNITS



Property, state income, and franchise taxes
Fire and other necessary insurance
Legal and auditing
Rentals and royalties
Stationery, postage, office supplies
Traveling expenses
Patent amortization
Bond interest
Repairs and renewals

Exhibit 3 shows the total period costs for the Reisson Company as defined above, and also the variable costs, which were taken as being the difference between total costs and period costs. Mr. Driscoll also prepared Exhibit 4, which shows the period and variable costs as cost per sales dollar and per sales unit.

In order to study period costs, Mr. Driscoll constructed a scatter chart (Exhibit 5) showing how monthly period costs per unit and total monthly period costs varied in relation to volume. On examining the upper chart of Exhibit 5, Mr. Driscoll found that there was a definite tendency for period costs per unit to vary with volume. (Note that on this part of the chart, the *y* scale from 0 to 8 has been condensed.)

The lower chart of Exhibit 5, showing total period costs plotted against volume, showed variations to be random, as Mr. Driscoll expected. (It should be noted that condensation of the *y* scale from 0 to 30 greatly accentuates the apparent amount of variations.) A more intensive study of the lower chart of Exhibit 5 showed Mr. Driscoll, however, that there was a definite progression in the level of period costs comparing one time period with another. In fact, when Mr. Driscoll computed the average *monthly* period costs for each of the three years, he found that the increase was fairly uniform, as shown below:

Year	*Months*	*Average Monthly Period Costs*
1949	1–12	$42,000 per mo.
1950	13–24	$47,000 per mo.
1951	25–36	$51,000 per mo.

The second part of the intensive investigation involved a study of variable costs. Mr. Driscoll thought that after all the period costs had been segregated, the remaining costs should be variable costs, changing with volume; however, he found that this was not the case after he plotted variable costs per unit against sales units (Exhibit 6). (Note that on Exhibit 6 the variations are greatly accentuated by condensing the *y* scale from 0 to 82.) "Of course," Mr. Driscoll stated, "we did not expect exactly a straight line horizontally across the chart showing an equal unit variable cost regardless of volume. Nevertheless, it is sur-

Exhibit 3

REISSON COMPANY

Segregation of Period and Variable Costs Three Years by Months
Thousands of Dollars

Month	Total Costs*	Segregation	
		Period Costs	Variable Costs
1	$418	$50	$368
2	349	45	304
3	247	47	200
4	229	42	187
5	193	41	152
6	327	38	289
7	279	31	248
8	363	37	326
9	354	39	315
10	328	43	285
11	346	41	305
12	368	48	320
13	506	53	453
14	517	49	468
15	380	42	338
16	490	51	439
17	452	48	404
18	354	52	302
19	275	39	236
20	472	46	426
21	388	48	340
22	371	42	329
23	391	47	344
24	541	49	492
25	489	49	440
26	482	47	435
27	417	53	364
28	420	48	372
29	462	52	410
30	439	51	388
31	333	47	286
32	375	51	324
33	443	55	388
34	413	53	360
35	461	56	405
36	435	51	384

* Excludes federal income and excess profits taxes; from Exhibit 1.

Period costs are presumed to have been determined by element (see text) and carried forward to this schedule.

Variable costs are determined by deduction of period from total costs.

Exhibit 4

REISSON COMPANY

Period and Variable Costs per Sales Units and Sales Dollars Three Years by Months

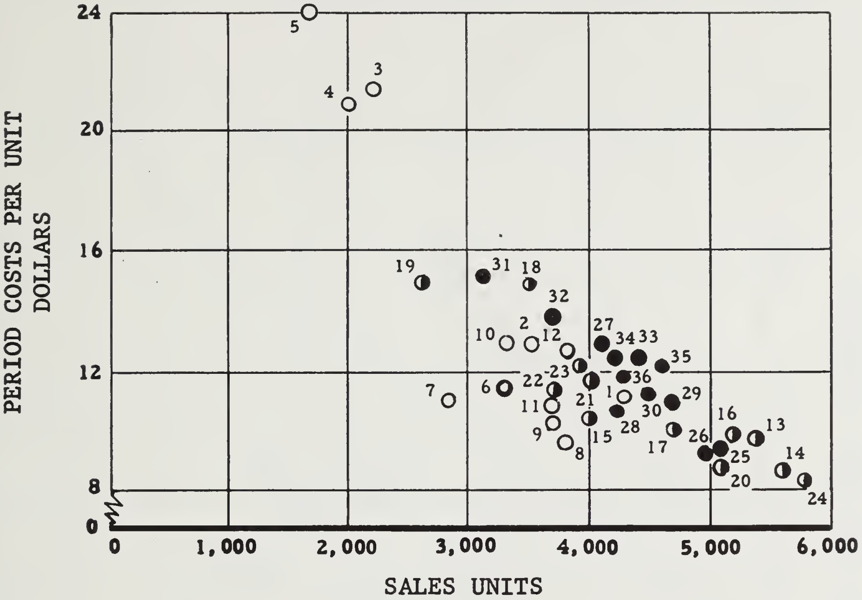
Month	Period Costs		Variable Costs	
	Per Sales Dollar	Per Sales Unit	Per Sales Dollar	Per Sales Unit
1	11.1¢	$11.40	81.4¢	$83.60
2	13.0	12.90	87.9	86.90
3	19.6	21.40	83.3	90.80
4	19.1	21.00	85.0	93.50
5	23.3	24.10	86.4	89.30
6	11.0	11.50	83.3	87.50
7	11.1	11.10	88.6	88.70
8	9.6	9.70	84.5	85.70
9	10.3	10.50	83.3	85.10
10	13.0	13.00	85.8	86.30
11	10.9	11.10	80.9	82.40
12	12.6	12.60	84.2	84.20
13	9.6	9.80	82.4	83.90
14	8.6	8.80	82.5	83.60
15	10.20	10.50	82.4	84.50
16	9.50	9.80	81.6	84.50
17	9.9	10.20	83.5	86.00
18	13.8	14.90	80.1	86.30
19	15.4	15.00	93.3	90.80
20	9.0	9.00	83.5	83.60
21	11.8	12.30	83.7	87.20
22	10.7	11.40	84.1	89.00
23	11.3	11.80	82.7	86.00
24	8.2	8.40	82.0	84.80
25	9.4	9.60	84.0	86.30
26	9.2	9.40	85.1	86.90
27	12.4	12.90	84.8	88.70
28	11.0	11.20	85.5	86.60
29	10.7	11.10	84.0	87.20
30	11.0	11.30	83.6	86.30
31	14.8	15.20	89.9	92.30
32	13.2	13.80	84.2	87.50
33	11.9	12.50	83.8	88.10
34	12.3	12.60	83.7	85.70
35	11.8	12.20	85.1	88.10
36	11.5	11.90	86.5	89.30

Exhibit 5

REISSON COMPANY

Three Years by Months

REVIEW OF PERIOD COSTS
COSTS PER UNIT V. UNIT VOLUME



TOTAL COSTS V. UNIT VOLUME

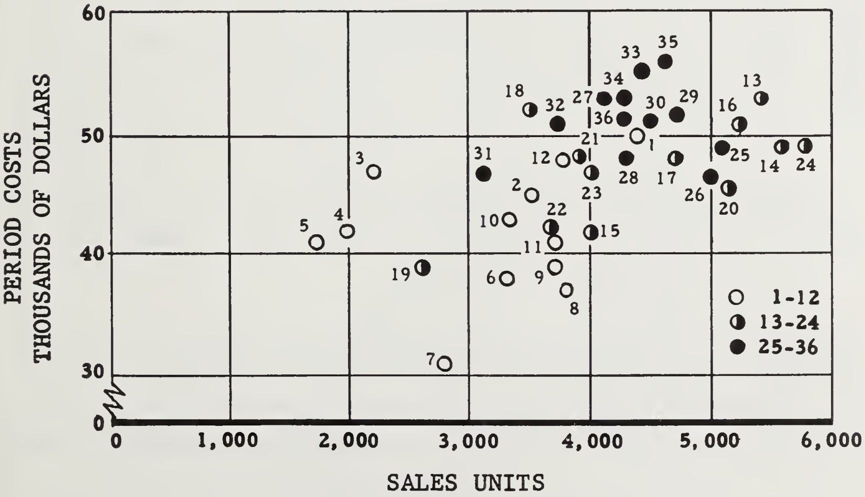


Exhibit 6

REISSON COMPANY

Variable Costs per Unit Compared with Unit Sales Volume
Three Years by Months

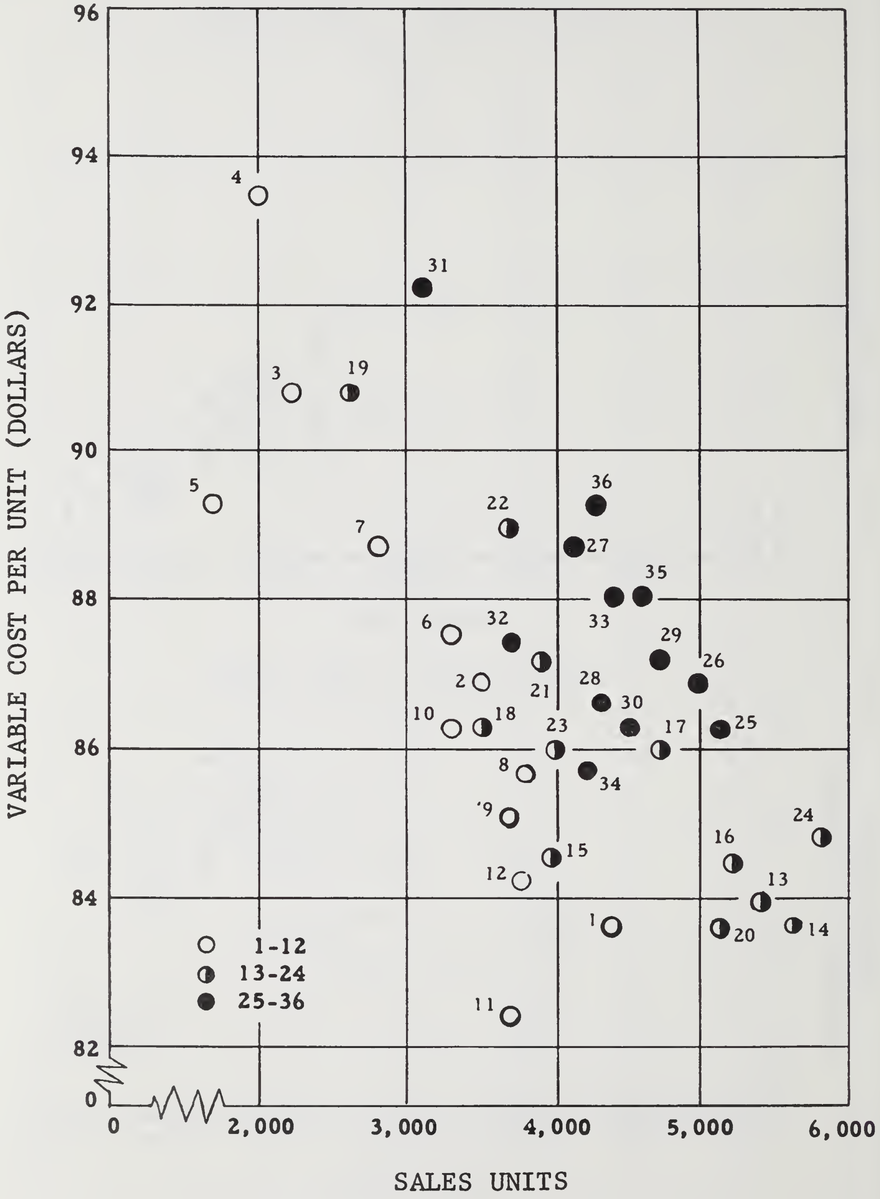
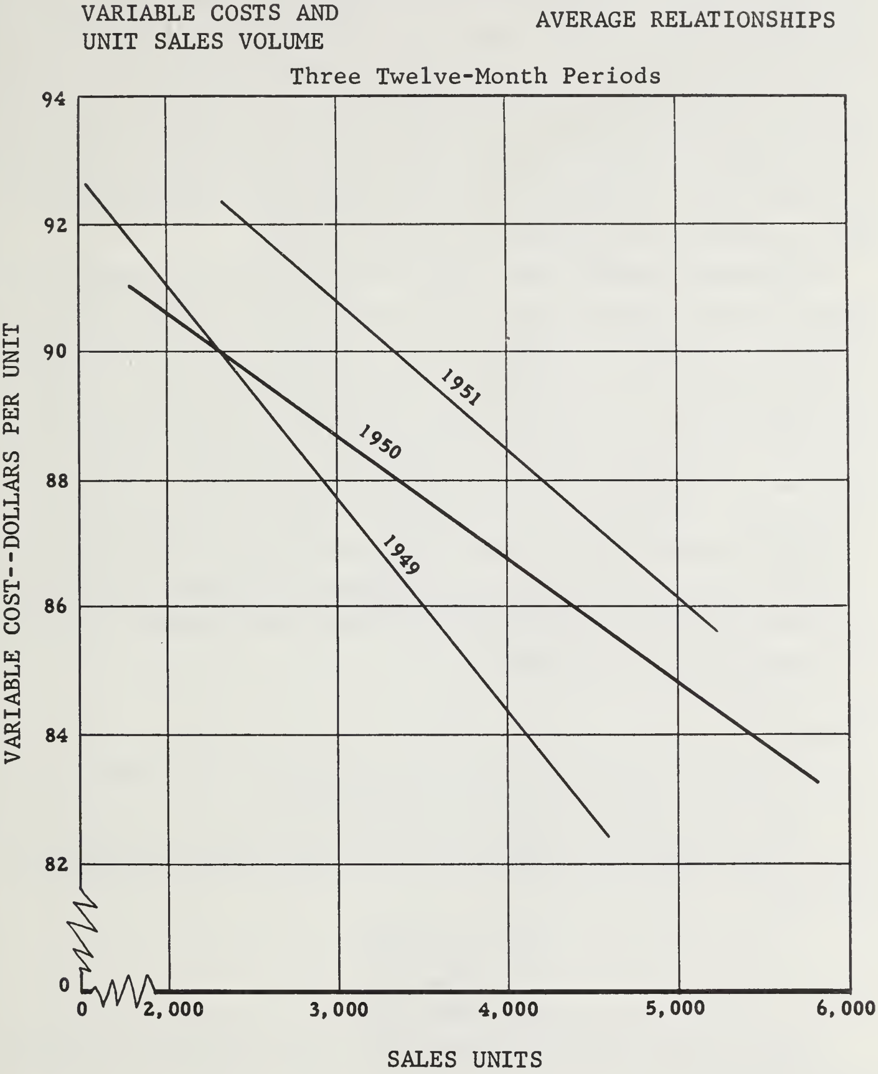


Exhibit 7

REISSON COMPANY



prising to note from the location of the plotted points that variable costs per unit actually seem to decrease with increasing volume. While the effect is not nearly so large as for period costs, I found that there was a definitely measurable variation between variable costs per unit and increasing volume."

Mr. Driscoll went on to say, "The reasons for this are cloudy, although there are a number of possibilities. It may be due, in part, to the residual effect of incompletely segregated period costs. The most conspicuous controllable element in manufacturing costs is labor—salaries and wages paid for productive effort. When volume drops, it is very human to 'stretch' six hours of work to eight. Conversely, when there is a large backlog of work, there is a real possibility of achieving a little extra productivity by the simple and normal acceptance by operators of the challenge represented by work to be done. Also, many of the tools, operating supplies, and other elements entering into variable costs progress in steps rather than in direct proportion to quantities processed. The net result is that total variable costs vary with volume but at different rates for different operating ranges."

Because the variable costs varied with volume and because each group of twelve monthly unit costs seemed to be at a higher level indicating an upward movement in these variable costs, Mr. Driscoll prepared regression (i.e., correlation) lines for each of the twelve monthly groups (Exhibit 7) in order to see more clearly the existing relationships. If variable costs had been completely variable, the variable costs per unit as a function of volume would be represented by a horizontal straight line. (Interpretation of Exhibit 7 should be tempered by the realization that the range of values for unit variable costs is very small.)

After making the foregoing investigation, Mr. Driscoll was faced with the problem of tying together the material and presenting specific recommendations to management.

Questions

1. What did Mr. Driscoll find out about past operations that could be used as a basis for (*a*) action or (*b*) further investigation?

2. What would be your estimate of profit (or loss) before taxes in January, 1952 (month number 37), under each of the following different assumptions as to sales:

a) 0 units
b) 3,000 units
c) 5,000 units
d) 7,000 units

3. What can Mr. Driscoll recommend about future operations, specifically for the year 1952?

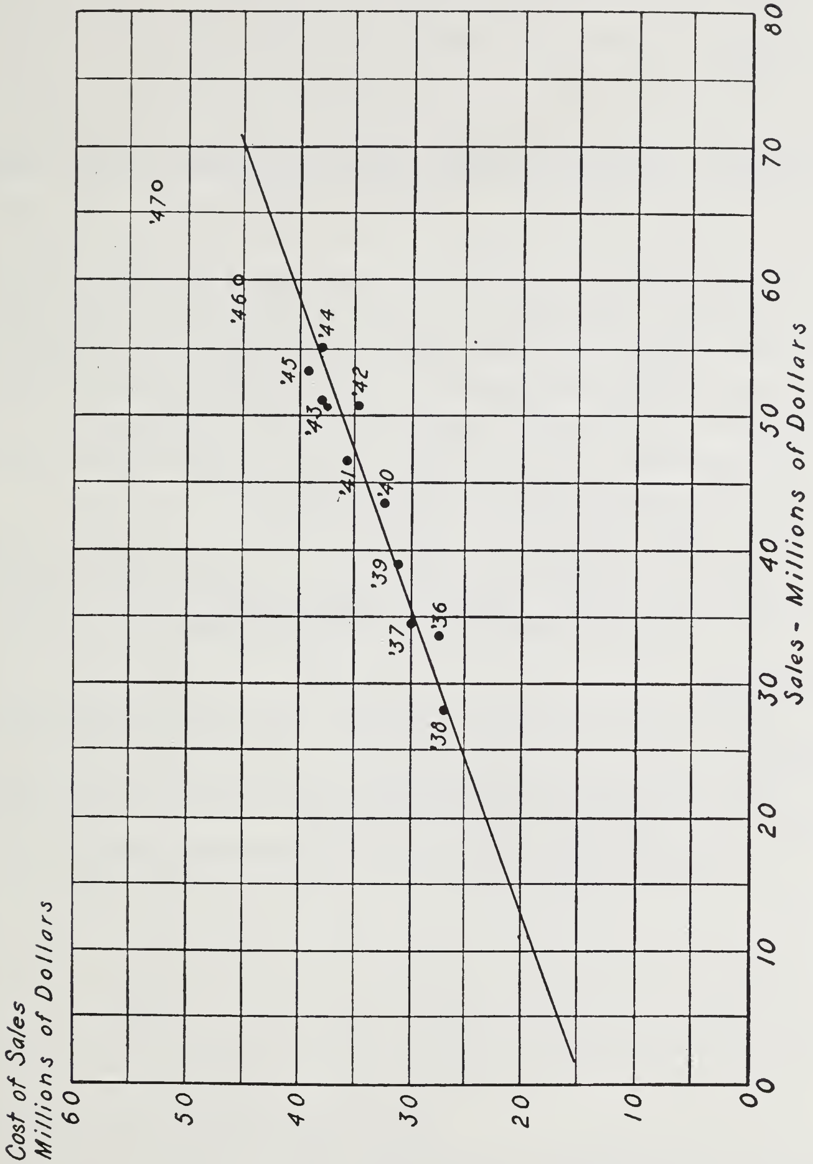
4. If you were a member of top management, would you accept the conclusions reached by this analysis, would you reject them, or would you accept them with reservations?

CASE 16–4. TRACY MANUFACTURING COMPANY

In the summer of 1947 there was considerable feeling among the executives of the Tracy Manufacturing Company that costs were out of line. The company had made good profits for several years, and it was be-

Exhibit 1

TRACY MANUFACTURING COMPANY



lieved that under such conditions laxity in cost control had developed. The end of World War II in 1945 and the sharp increases in prices in 1946 had also created problems.

The Tracy Manufacturing Company made a variety of tools. Although the company concentrated on small tools which were sold through mail-order houses and hardware stores, it also manufactured larger tools sold directly to manufacturers. The company used a well-developed cost accounting system.

In an effort to determine whether the cost-sales relationship had changed, the treasurer had an assistant plot the total cost of sales for each of the years 1936–45 (taken from income statements) against net sales for each of those years (see Exhibit 1). A trend line was then fitted to these points by the method of "least squares"; that is, the line was drawn in such a way that the squares of all deviations of actual points from the line were at a minimum. When, however, the actual cost for 1946 and the budgeted cost for 1947 were plotted against actual and projected sales, the points were found to fall well above the previous line of relationship. On seeing the chart, some of the executives were quick to point out that here was proof of the company's growing inefficiency. The treasurer, however, believed that more study was needed before any such conclusion could be reached.

The treasurer asked his assistant to initiate a study which would, among other things, answer the following questions.

1. Are the 1946 and 1947 points out of line?
2. If so, why are they out of line?
3. If volume declines, what line of relationship can cost be expected to follow? What has happened to the break-even point?

Questions

1. What was the approximate "break-even" point under the 1936–45 relationship?
2. What are some of the possible reasons why the 1946 and 1947 points departed from the 1936–45 line of relationship?
3. What steps would you take in order to answer the treasurer's questions?

Chapter

17

PROJECT PLANNING: RELEVANT COSTS

Project planning is a name given to the process of making a decision on a specific business problem, as contrasted with *period planning* which is the process of planning for the operation of the business as a whole. Most business decisions are made by choosing what is believed to be the best alternative out of several possible courses of action. Problems in this area are therefore often called "alternative choice problems."

In a great many business problems, the decision is made intuitively; that is, there is no systematic attempt to measure and weigh the advantages and disadvantages of the possible alternatives. A person who makes an intuitive decision may do so simply because he is not aware of any other way of making up his mind, or he may do so for the very good reason that the problem is one in which a systematic attempt to weigh alternatives is either not useful or not possible. No mathematical formula will help to solve a problem where the attitudes or emotions of the individuals involved are dominant factors. Nor is there any point in trying to make calculations if the available information is so sketchy or so inaccurate that the results are completely unreliable.

In many other situations, however, it is possible to reduce at least some of the anticipated consequences of the alternatives to a quantitative basis and to weigh these consequences in a more or less systematic manner. Usually, this process involves a consideration of accounting data, particularly cost data. Some of the problems that arise in using costs as an aid in making business decisions are discussed in this chapter.

Basic Premise: Profit Maximization

For the purposes of this discussion, it is assumed that the best alternative of those under consideration is the one that maximizes profit; that is, it is the alternative that ultimately adds the most to the stockholders' equity. In problems where revenue is unaffected by any of the alternatives, the best alternative is the one with the lowest cost.

The profit-maximization assumption is made here only because such an assumption makes it easier to discuss certain concepts and techniques that are useful in solving alternative choice problems. In many practical problems, and in many of the cases in this book, this assumption is not entirely valid, and in such situations it should be dropped or at least qualified. Personal satisfaction, friendship, patriotism, or other considerations may in fact be much more important than the objective of profit maximization. In situations where these other objectives are important or dominant, the most that a cost analysis can show is the effect on profits of seeking an objective other than profit maximization. The problem then becomes one of deciding whether the attainment of the other objective is worth the cost.

General Approach

The following list of steps may provide a useful way of approaching problems of the type discussed in this chapter:

1. Define the problem.
2. Define the most likely alternative solutions.
3. Measure and weigh those consequences of each alternative that can be expressed in quantitative terms.
4. Evaluate those consequences that cannot be expressed in quantitative terms and weigh them against each other and against the measured consequences.
5. Reach a decision.

Since this chapter has to do primarily with costs, which are a means of measuring factors that can be expressed in quantitative terms, our discussion relates principally to Step No. 3. Brief mention will be made of the other steps to the extent that they bear on the problem of analyzing costs, but in no sense is this to be considered a comprehensive discussion of the art of decision making.

Definition of the Problem and of Alternative Solutions

Unless the problem is clearly and precisely defined, cost figures that are relevant to it cannot be computed. In many situations, the definition of the problem, or even the recognition that a problem exists, may be the most difficult part of the whole process. In most of the cases accompanying this chapter, however, the nature of the problem is usually evident. Even so, it is useful to state the problem as precisely as possible before proceeding further.

Quite often, the possible alternative[1] solutions to the problem are by no means clear at the outset. For example, suppose that a company has listened to a machinery salesman's story of the advantages of using his machine to manufacture a part that is now being made by manual methods and is now trying to decide what to do about the salesman's proposal. At first glance, the alternatives may appear to be: (*a*) buy the new machine, or (*b*) continue to perform the operation by hand. Actually, however, it may be desirable to consider several other alternatives, such as: (*c*) buy a machine other than the one recommended by the salesman, (*d*) improve the present method of making the part, or even (*e*) eliminate the operation altogether and buy the part from another manufacturer. Consideration should be given to these other possibilities before attention is focused too closely on the original proposal.

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[1] Grammarians argue that there can be only two "alternatives." As used here, the word "alternative" often refers to more than two; this is a more convenient definition for our purposes.

On the other hand, the more alternatives that are considered, the more complex the analysis becomes. For this reason it is desirable, having considered all the possible alternatives, to eliminate at the outset those that are clearly unattractive, leaving only a few for detailed analysis. In the simplest situation, only two alternatives are examined closely. These can be described in general terms as: (*a*) the continuation of what is now being done, or (*b*) the adoption of a proposed change—a new machine, a new process, a new selling price, and so on.

Weighing and Measuring the Quantitative Factors

In any business problem there are usually a number of advantages and a number of disadvantages associated with each of the alternative solutions. The task of the analyst is to evaluate each of the relevant factors and to decide, on balance, which alternative has the largest *net* advantage.

If the factors are stated solely in words, such an evaluation is an exceedingly difficult task. For example, consider the statement that a proposed process will save labor but that it will result in increased power consumption and require additional insurance protection. Such a statement provides no way of weighing the relative importance of the saving in labor against the increased power and insurance costs. If, on the other hand, it is stated that the machine will save $1,000 in labor, that increased power will cost $200, and that increased insurance will cost $100, the net effect of these three factors can easily be estimated; that is, $1,000 — $200 — $100 is a net advantage of $700 for the proposed process.

The reason that we try to express as many factors as possible in quantitative terms is clear from the above illustration: once we have done so, it becomes easier to find the net effect of these factors by the simple arithmetic operations of addition and subtraction.

In many business problems, cost is the most useful basis for expressing the quantitative importance of the various relevant factors since cost is a common denominator that can be used to measure a variety of diverse factors. Revenue is also a factor in some problems, and the same considerations that are discussed here for cost figures apply with equal force to revenue figures.

The costs that are relevant to a business decision can be summed up in two brief statements: (1) they are *future* costs, and (2) they are *differential* costs.

Future Costs

No decision made by man can change what has already happened. The past is history; decisions made now can affect only what *will* happen in the future. It follows that the only relevant cost figures are estimates of what costs will be in the future.

The difficulty in applying this obvious statement arises from the fact that in many instances our best information about future costs is derived from an analysis of past, or historical, costs. It is easy to lose sight of the fact that historical costs *per se* are literally irrelevant. These historical costs, often obtained from the accounting records, may be a useful guide as to what costs are likely to be in the future, but using them as a guide is basically different from using them as if they were statements of what the future costs are in fact *going* to be.

Except where costs are determined by long-term contractual arrangements, future costs are necessarily estimates, and they usually cannot be close estimates. An estimated labor saving of $1,000 a year for five years, for example, implies assumptions as to future wage rates, future fringe benefits, future labor efficiency, future production volume, and other factors that cannot be known with certainty at the time the estimate is prepared. There is therefore ordinarily no point in carrying computations of cost estimates to several decimal places; in fact, there is a considerable danger of being misled by the illusion of precision that such meticulous calculations give.

Book Value of Fixed Assets. A historical cost that seems to cause considerable difficulty is the book value of fixed assets. Suppose that a company purchased a machine two years ago for $10,000, that it has accumulated depreciation of $2,000 on it, and suppose that it is now proposed that this machine be replaced by a better machine. The existence of the better machine has made the present machine obsolete. Is the $8,000 book value of the present, obsolete machine in some way a part of the cost of the proposed new machine? It is not. The book value of the present machine is the result of actions taken in the past. It is therefore a *sunk cost.* It is not a cost that is relevant in connection with a decision to be made now since no current decisions can change it. The *current market value* of the present machine is relevant since the proposed action may include the sale of this machine. The write-off of book value may reduce income taxes (as discussed in Chapter 18); or the management may, for psychological reasons, be reluctant to record, or even recognize, the loss on the obsolete machine. Nevertheless, the past actions that gave rise to the $8,000 book value cannot be changed by a decision made now.

The irrelevancy of book value can be demonstrated by comparing two income statements for the complete period covered by the decision, one showing results of operations if the machine is purchased and one showing results if it is not purchased. Let us assume that the proposal is to purchase a new machine for $20,000, that this machine will last for ten years, and that the machine will result in a decrease in labor and material cost of $3,000 a year, or $30,000 over the ten years, as compared with costs of the present method of operations. The present machine has no salvage or resale value. An income statement for the ten-year period if the new machine is not purchased is assumed to be as shown in Column A of Illustration 17–1. Column B shows how the income statement will look if the machine is purchased.

Illustration 17–1

INCOME STATEMENT FOR THE ENTIRE TEN-YEAR PERIOD

	A. *If New Machine Is Not Purchased*		*B.* *If New Machine Is Purchased*	
Sales		$1,000,000		$1,000,000
Costs and expenses:				
Material and labor	$300,000		$270,000	
Overhead, other than depreciation	400,000		400,000	
Depreciation on present machine	8,000		.....	
Loss on disposal of present machine	....		8,000	
Depreciation on new machine	....		20,000	
Total Costs and Expenses		708,000		698,000
Profit before Income Taxes		$ 292,000		$ 302,000
				−292,000
Additional Profit if Machine Is Purchased				$ 10,000

If the old machine is retained, there will be a regular depreciation charge for its use which, over the ten-year period, will amount to its total book value, or $8,000. If the new machine is purchased and the old machine is discarded, the book value of the old machine must be written off as a loss, and *this also* amounts to \$8,000. Thus, the \$8,000 book value has the same ultimate effect on profit under either alternative and can therefore be ignored. The additional profit resulting from the purchase of the machine is simply the cost savings for ten years (\$30,000), minus the purchase price (\$20,000), or \$10,000.[2]

Differential Costs

A great many cost items will be unaffected by the alternatives under consideration, and these may be disregarded entirely. Attention is focused on items whose costs will be *different* under one alternative from what they will be under the others. Suppose, for example, that a company is considering the possibility of buying Part No. 101 from an outside supplier instead of manufacturing the part as it is now doing. In this case the alternatives are either: (*a*) to continue manufacturing Part No. 101 or (*b*) to purchase Part No. 101 from the outside supplier. All revenue items, all selling and administrative expenses, and all production expenses other than those directly associated with the manufacture of Part No. 101 will probably be unaffected by the decision; and if so, there is no need to consider them. In some calculations, it may be convenient to list some or all of these unaffected costs, so as to insure that all relevant cost items have been considered. This was done, for example, with the "overhead" item in Illustration 17–1. There is no harm in doing so, provided the unaffected costs are treated exactly the same way under each of the alternatives, because the net difference between the costs of the two alternatives, which is the figure in which we ultimately are interested, is not changed by adding *equal* amounts to the cost of each alternative.

The term "differential costs" is practically synonymous with the term "incremental costs," but it does *not* have quite the same meaning as the term "variable costs." Variable costs are those that vary directly with, and roughly proportionately to, changes in the *volume of output;* that is, if output increases 50 per cent, variable costs will increase approximately 50 per cent. Differential costs are related to the specific alternatives that are being analyzed. If, in a specific problem, one of the alternatives involves a change in output, then differential costs may be the same as variable costs. In other problems, however, the differential costs may include only part or none of the variable cost items, and they may include some nonvariable items.

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[2] In order to focus on the problem of book value, income taxes and differences in the timing of the various costs have been ignored in this illustration, and it has been assumed that the present machine will last physically for at least ten more years. These matters will be discussed in Chapter 18.

Costs from a Cost Accounting System. In considering "costs that make a difference," figures drawn from a cost accounting system may be misleading since differences in such figures may not reflect real differences in cost. For example, for cost accounting purposes, the "cost" of Part No. 101 may include charges for rent, heat, light, and other occupancy costs that are prorated to this product on the basis of the number of square feet of floor space occupied by the department in which it is manufactured. If Part No. 101 were purchased from an outside vendor, the floor space formerly used in its manufacture would be saved. It does not necessarily follow, however, that the *costs* prorated to Part No. 101 on the basis of floor space used would actually be saved. The costs for rent, heat, light, and so on might not be changed at all by the decision not to manufacture the part. Unless there is some real saving in cash outlays (or their equivalent) or some real additional revenue possibilities resulting from the use of the freed floor space (e.g., renting it, or manufacturing some revenue-producing item in it), the difference in the *accounting* charges prorated on the basis of floor space should be ignored.

In general, all *allocated or prorated* accounting charges should be viewed with skepticism in attempts to estimate differential costs. As pointed out in Chapter 10, a cost accounting system is usually set up in such a way that each unit of product manufactured is charged with its fair share of all manufacturing costs, including costs which are not directly caused by or traceable to the product. This is done so that inventory and cost of sales figures will reflect the total costs of manufacturing the product. Such cost figures are not intended to show, and in fact do not show, the differential costs that are relevant in most alternative-choice problems. For example, a company may allocate overhead as 100 per cent of direct labor; but this does *not* mean that if direct labor cost is decreased $575 by purchasing Part No. 101, there will be a corresponding decrease of $575 in overhead costs. Overhead costs may not decrease at all; they may decrease, but by an amount less than $575; or they may even increase, as a result of an increased procurement and inspection workload. In order to estimate what will happen to overhead costs, it is frequently necessary to go behind the overhead rate and to analyze separately what will happen to the various elements of overhead under each of the alternatives being considered. This point is emphasized because there is a tendency to think of conventional product costs as if they were *the* "cost" of the product rather than to think of the specific elements of costs that are applicable in the problem being studied.

Fringe Benefits. Labor costs are one of the important considerations in many business decisions. In estimating labor costs, it is often desirable to include an allowance for fringe benefits in addition to the actual amount of wages earned for the work done. Fringe benefits include such items as old age and unemployment compensation taxes; insurance, medical, and pension plans; vacation and holiday pay; and the like. Recent studies indicate that these benefits may average as much as 25 per cent of wages earned, although there is so wide a variation among different companies that it is not safe to assume that this figure can be used generally. To the extent that the cost of these fringe benefits varies directly with wages paid, they are relevant when costing an alternative that involves a change in labor costs.

Imputed Costs. Most, but not all, relevant cost figures are represented by real cash outlays. In some cases, it is desirable to broaden the concept of cost to include sacrifices that are not immediately reflected in the cash account; in other words, it is sometimes desirable to include certain *imputed* costs.

Interest cost is an example of a cost that is frequently included in a calculation even though no actual cash interest payment is involved. If one alternative involves an additional investment, then the interest on money borrowed for the purpose of making this investment is a cost of this alternative. Even if the investment is made without using borrowed money, however, there is a sacrifice in the sense that using the money to make the investment means that it cannot be used for other productive purposes. This sacrifice can be reflected in the calculations by estimating what the interest would have been if the money had been borrowed, or what the return would have been if the money had been used for other purposes. On the other hand, it is often desirable to omit interest as an element of cost and to treat it separately by methods described in Chapter 18.

General Characteristics of Differential Costs. Few specific suggestions can be made as to what costs should be included in an alternative choice calculation because there is a wide variety of problems, each with its own characteristics. In general, we are looking for costs which *would* be incurred if the alternative were adopted but which *would not* be incurred if the alternative were not adopted; in other words, for differential or incremental costs. Labor costs are incremental costs in many problems; but if in a specific case people are going to be employed regardless of which alternative is adopted, labor costs may not be incremental. For example, it can be demonstrated that a given quantity of material can be typed in less time with an electric typewriter than with a nonelectric typewriter, but no real saving in labor costs will result from the purchase of an electric typewriter if the time thus freed is not used productively for some other purpose.

Another generalization is that the longer the time period that the proposition covers, the more cost elements are differential. In the short run, there are relatively few cost elements that can be changed by a management decision, but if a long enough time period is considered, practically all cost elements are differential.

Mechanics of the Calculation

Any of several devices can be used for combining the various cost elements that are relevant to each alternative. Costs may, for example, be listed separately under each alternative, viz.:

	If Part No. 101 Is Manufactured		*If Part No. 101 Is Purchased*
Purchased material	$ 572		$1,700
Labor	600		25*
Power	98		0
Other costs	150		0
Total	$1,420		$1,725
Difference (Disadvantage of Purchasing)		$305	

* Estimated handling cost.

Or, exactly the same result can be obtained by figuring the net differences between the alternatives, viz.:

Purchase price of Part No. 101		$1,700
Costs saved by not manufacturing Part No. 101:		
Raw material	$572	
Labor	575	
Power	98	
Other costs	150	
Total Costs Saved		1,395
Net Disadvantage in Purchasing		$ 305

The same result can also be obtained by preparing a complete income statement for each alternative for the total time period involved in the proposition, as was done in Illustration 17–1. This requires more work than either of the other two types of calculations shown above, but it provides a useful way of assuring that some cost or revenue elements have not been overlooked, and it may also provide a useful way of explaining your calculations to someone else.

The Margin of Error

Cost figures used in alternative choice problems are estimates, and in many cases they are very rough estimates. In some calculations, an attempt is made to express the margin of error in these estimates by making two sets of calculations, one in which costs are estimated on the high side and the other in which they are estimated on the low side. Even though the range between these two estimates is wide, the rough estimates may be more useful than no figures at all since they set boundaries on the net influence of the factors that are contained in them.

A variation on this procedure is to estimate a high figure and a low figure and then to make a compromise estimate that lies between the two extremes. This is often a useful device, but it should be recognized that the compromise or "best guess" is not necessarily a more correct estimate than either the high or the low figure. The reliability of the estimate depends on the uncertainties involved, and there may be no way of eliminating or minimizing these uncertainties.

Some analysts are experimenting with techniques for expressing, in the form of statistical probability statements, the degree of accuracy that they believe to be present in each cost figure, but little practical use of these techniques has as yet been made.

Example—Operating an Automobile

As an example of the fact that the cost elements that are relevant in an alternative choice problem vary with the nature of the problem, let us consider the costs that are relevant for various decisions that may be made about owning and operating an automobile. A study made by Runzheimer and Company and published by the American Automobile Association gives the national average 1954 cost of operating an automobile in the $2,000 price class, postwar model, driven up to 18,000 miles per year, as follows:

Variable Costs:	*Average per Mile*
Gasoline and oil	2.29 cents
Maintenance	0.74
Tires	0.51
Total	3.54 cents
Nonvariable Costs:	*Annual*
Fire and theft insurance	$ 17.81
Property damage and liability insurance	86.65
License fees	16.83
Depreciation	477.36
Total	$598.65

What costs are relevant? In answering this question, we shall assume that the car in question resembles the automobile for which the averages were computed; that gasoline prices, insurance rates, and the like are "average" in the locality in which the automobile is to be operated; that the AAA figures are reliable; that the classification of certain costs as variable and others as nonvariable is valid; and that costs during the period in which the automobile will be operated will be the same as they were in 1954. Unless each of these assumptions is reasonable, the figures given above cannot be used. Accepting these assumptions, we can make the following statements about relevant costs:

1. When you own the automobile, already have it registered, and are deciding whether it is worth while to make a proposed trip, the relevant costs are 3.54 cents per mile times the estimated mileage of the trip. The nonvariable costs are not relevant since they will continue whether or not the trip is made. (Costs are shown here exactly as reported in the AAA table above; actually, you would undoubtedly round off the numbers rather than showing the figures to hundredths of a cent.)

2. When you own the automobile and are deciding whether to (*a*) register it for a year or (*b*) leave it idle and use some other form of transportation, the relevant costs are the insurance and fees of $121.29 plus 3.54 cents per mile times the number of miles you expect to travel by automobile during the year. The $121.29 has become a cost because it is affected by the decision as to registration.

3. When you are deciding whether to (*a*) buy an automobile or (*b*) use some other means of transportation, the relevant costs are $598.65 per year plus 3.54 cents per mile times the number of miles you expect to drive. (Actually, in this case you probably would have a closer estimate for depreciation for the specific automobile under consideration than the average figure of $477.36.)

Other statements can be made for the costs relevant to other contemplated uses of the automobile. These illustrations may help to clarify the basic point that the relevant costs for a given decision are the costs affected by that decision; other costs can be ignored.

Evaluating and Weighing the Unmeasured Factors

It should be emphasized that the foregoing discussion of costs relates only to those factors that can be measured in cost terms. The final decision must take into account *all* differences between the alternatives being considered, and for most problems there are important factors that are not measurable. The process of weighing the relative importance of these factors, both as compared with one another and as compared with the net advantage or disadvantage of the measured factors, is solely a judgment process.

It is easy to underestimate the importance of these unmeasured factors. The cost calculation often requires hard work and results in a figure that has the appearance of being definite and precise; yet all the factors that influence the final cost figure may be collectively less important than a single factor that has not been measured. For example, there are undoubtedly many persons who could meet their transportation needs less expensively by using public conveyances rather than by owning an automobile, but who nevertheless own an automobile for reasons of prestige, convenience, or other unmeasured factors.

The cost calculations make it possible to express as a single figure the net effect of a number of factors bearing on the decision. They therefore reduce the number of factors that must be considered separately in the final judgment process that leads to the decision; or, as is often said, they narrow the area within which judgment must be exercised. Rarely, if ever, do they eliminate the necessity for this final step.

Some Suggestions

The following points may be helpful in attacking specific cases:

1. Use imagination in choosing the possible alternatives to be considered, but don't select so many alternatives that you bog down before you begin. There is only a fine line between the alternative that is a "stroke of genius" and the alternative that is a "harebrained idea," but it is a crucial one.

2. Don't succumb to the natural temptation to give too much weight to the factors than can be reduced to figures, even though the figures have the appearance of being definite and precise.

3. Often, it is easier to work with total costs rather than with unit costs. Unit cost is a fraction in which total cost is the numerator and number of units the denominator, that is,

$$\frac{\text{Total cost}}{\text{Number of units}} = \text{Unit cost.}$$

Changes in either the numerator or the denominator result in changes in unit costs. It is easy to think only of one of these changes and overlook the other.

4. There is a tendency to underestimate the cost of doing something new because all the consequences are often not foreseen.

5. The *number* of arguments is irrelevant in an alternative choice

problem. A dozen reasons may be, and often are, advanced against trying out something new, but all these reasons put together may not be as strong as a single argument in favor of the proposition.

6. Be realistic about the margin of error in any calculation involving the future. Fancy figures cannot be made out of rough estimates, nor is an answer necessarily precise or valid simply because you spent a long time calculating it.

7. Despite uncertainties, a decision should be made if as much information is available as can be obtained at reasonable cost and within a reasonable time. Postponing action is the same as deciding to perpetuate the existing situation, which may be a poor choice.

8. Do not expect that everyone will agree with your conclusion simply because it is supported with carefully worked-out figures. Think about how you can sell your conclusion to those who must act on it.

CASES

CASE 17–1. HARCORD WHOLESALE GROCERS, INC.

Prior to 1955, Harcord Wholesale Grocers, Inc., had kept no departmental income statements. In order to control operations more effectively, the management decided at the beginning of that year to install

Exhibit 1

HARCORD WHOLESALE GROCERS, INC.

Income Statement, Fresh Fruit Department

		Per Cent
Net sales	$416,016	100.0
Cost of sales	375,246	90.2
Gross margin	$ 40,770	9.8
Expenses:		
Payroll, direct labor, and supervision in the department	$ 17,640	
Salesmen's commissions (fruits sold by general salesmen selling for all departments on straight, uniform, commission basis)	6,396	
Rent (charged to department on basis of yearly rental per square foot occupied. The company rented and occupied an entire building.)	16,440	
Taxes (assessed by state on average value of inventory)	600	
Insurance (for protection of inventory)	480	
Depreciation (basis: 5 per cent on departmental equipment)	1,560	
Administration and general office (allocated on basis of departmental sales)	7,824	
Interest on inventory (an accounting charge; actually there was no outside borrowings for working capital)	235	
Total Expense	$ 51,175	12.3
Net Loss	$ 10,405	2.5

departmental cost accounts. At the end of 1955, the new accounts showed that although the business as a whole had a gross margin of 13.1 per cent and a net profit of 1.1 per cent on net sales of $2,408,000, the fresh fruit department had shown a substantial loss, with a gross margin of only 9.8 per cent of its $416,000 net sales, against an expense rate of 12.3 per cent. The income statement for the fresh fruit department is shown in Exhibit 1.

This loss led one executive to argue that the department should be discontinued. The executives agreed that, so far as the factor of customer satisfaction with the completeness of the company's line was concerned, it was not essential to continue selling fresh fruits. Elimination of this department, in other words, was not expected to result in loss of sales by other departments.

After several protracted discussions of the proposal to discontinue the fresh fruit department, one of the executives sought to end the controversy by saying that the company should discontinue either the department or the new accounting system.

Question

1. What action should be taken?

CASE 17–2. RENNETT MACHINE COMPANY

The Rennett Machine Company manufactured complicated heavy industrial machinery. Production of the machinery line included the assembly of thousands of parts, ranging from small nuts to large castings. The company was relatively large, and many of the parts could be manufactured with its own facilities. In the past, the management had favored purchasing parts from outside suppliers.

The company had been profitable during the post–World War II period, but its record did not match that of its principal competitors. Many of the key executives were within five years of the compulsory retirement age of sixty-five. The leaders of two large stockholder groups were unimpressed with the caliber of the middle management team. As a result of these factors, the stockholders had agreed to a merger with an aggressive national corporation that was seeking diversification. The management of the parent corporation left the Rennett Company as a separate operation and did not initially change the existing management. However, a comprehensive review of Rennett Company policies was undertaken.

During this review, the question of establishing a policy covering "make or buy" decisions for component parts arose. As a result, the treasurer of the parent corporation and the controller of the Rennett

Company met to discuss the "make or buy" problem. It was readily agreed that when evaluating purchase opportunities, only those outside suppliers qualified as regards to price, quality, service, and financial stability would be considered. Then the controller described the Rennett Company cost system.

The Rennett Company cost accounting system included in product costs the usual elements of (1) direct material, (2) direct labor, and (3) overhead. Material costs were the actual direct material costs. Direct labor costs were charged to product costs at a uniform average rate per hour spent on the job. Most of the parts underwent similar machining operations, and labor rates throughout the plant did not vary widely. Therefore, the Rennett Company management believed this allocation method was free of substantial error.

Overhead costs were charged at a uniform rate per direct labor hour. Overhead costs were handled through the following accounts and classifications:

Fixed Overhead:
- Superintendence
- Administrative Expense
- Selling Expense
- Basic Foremanship Budget
- Building Repairs and Depreciation
- Depreciation and Obsolescence of Equipment
- General Taxes
- General Insurance

Variable Overhead:
- Indirect Labor
- Engineering Labor
- Cost and Payroll Department Labor
- Foreman (excess over minimum budgeted as fixed)
- Social Security Taxes
- Supplies
- Power

Twice a year, direct labor, variable overhead, and fixed overhead were totaled. Each of the three totals was divided by total direct labor hours for the six months. This resulted in three unit cost figures which were added together and titled the "basic cost of manufacturing." The basic cost of manufacturing at the time of this case was as follows:

	Cost per Direct Labor Hour, Excluding Material
Direct labor cost	$1.50
Variable overhead cost	1.76
Fixed overhead cost	1.32
Basic cost of manufacturing	$4.58

The basic cost of manufacturing was used for the six months following its computation to estimate the cost of making parts. The estimated direct labor hours for making the part multiplied by the basic cost of manufacturing gave the cost exclusive of actual material costs; material costs were added separately. In all cases where manufacturing a part was considered, it was assumed a one-year supply would be made in one production run. Thereby the cost accounting department could estimate both total and unit costs for the part.

The controller knew that the costing system allocated fixed overhead cost at a fixed rate per direct labor hour. As it was not related to the total current production volume, in effect the costing system avoided wide unit cost fluctuations. He stated that if total fixed overhead were charged to product cost, at a low production volume the overhead cost per unit would be excessively high. Conversely, at a high production level the unit fixed overhead allocation would be abnormally low. As the controller discussed the problem of a systematic approach to make-or-buy alternatives on parts, he expressed concern as to what really constituted the proper comparative costs the company should use.

The controller also recounted to the treasurer of the parent corporation the viewpoint of the purchasing department of the Rennett Company. The purchasing department had raised questions they considered important in the event many of the parts now purchased were produced by the Rennett Company. The level of activity in the plant fluctuated. If the company produced parts sporadically—that is, if it made parts when the plant was below capacity and attempted to buy them when the plant was at capacity—relations with suppliers would deteriorate. Suppliers to protect themselves would get other customers, and then the Rennett Company would not be assured of delivery at its convenience. Furthermore, the purchasing department knew that prices quoted by suppliers included allowances for marketing costs, financial costs, and profit. The purchasing people therefore advocated that over-all costs to the Rennett Company for parts manufacture should include a proportionate amount of marketing, administrative, and financial expenses and thereby be more comparable to prices quoted by suppliers.

At the end of the meeting, the treasurer of the parent corporation stated that the two key considerations were fixed overhead and the level of plant activity. When costing the manufacture of a part that could be purchased from outside suppliers, he said, fixed overhead should be excluded from the estimates when the plant was operating at less than capacity.

After the meeting the Rennett Company controller made two separate calculations of costs to serve as a guide for the purchasing department whenever a specific make or buy alternative arose concerning a part. The first calculation included all costs; the second excluded fixed overhead. The cost arrived at excluding fixed overhead was called "arbitrary manufacturing cost." The controller felt that the "arbitrary manufacturing cost" would serve as a valuable guide when the plant was below capacity.

Three examples prepared by the controller to illustrate the cost calculations are given in Exhibit 1.

Exhibit 1

RENNETT MACHINE COMPANY

Examples of Cost Calculations

Item	1 Hollow Steel Bushing	2 Hollow Steel Stud	3 Knurled Steel Rod
Annual requirements (units)	38,000	20,000	3,650
Total Material Cost	$621.00	$387.60	$387.50
Direct labor hours	362.5	963.2	222.4
Calculation of Total Cost:			
Direct labor hours at $4.58	$1,660.25	$4,411.46	$1,018.59
Material	621.00	387.60	387.50
Total Cost	$2,281.25	$4,799.06	$1,406.09
Cost per unit	$0.0600	$0.2400	$0.3852
Calculation of Arbitrary Manufacturing Cost:			
Direct labor hours at $3.26	$1,181.25	$3,140.03	$ 725.02
Material	621.00	387.60	387.50
Total Arbitrary Cost	$1,802.25	$3,527.63	$1,112.52
Cost per unit	$0.0474	$0.1764	$0.3048
Outside purchase price	$0.05	$0.1459	$0.3450
Decision	Manufacture	Purchase	Manufacture

Questions

1. Was the theory of the procedure adequate and appropriate to meet the Rennett Company purpose?
2. Was the theory well executed?
3. Are there better theories and practices that should have been followed?
4. Given these facts:
   Item: Solid steel stud

Annual requirements	25,000
Material cost	$526.40
Direct labor hours	262.7
Outside purchase price	$.0600 each

a) Make the calculations the company would make, as illustrated in the case.
b) How would the company have decided?
c) Do you think the company's decision would be correct?

CASE 17–3. HANSON MANUFACTURING COMPANY

In February, 1955, Mr. Herbert Wessling was appointed general manager by Mr. Paul Hanson, president of the Hanson Manufacturing Company. Mr. Wessling, age fifty-six, had wide executive experience in manufacturing products similar to those of the Hanson Company. The appointment of Mr. Wessling resulted from management problems arising from the death of Mr. Richard Hanson, founder and, until his death in early 1954, president of the Hanson Company. Mr. Paul Hanson had only four years' experience with the company, and in early 1955 was thirty-four years old. His father had hoped to train him over a ten-year period, but his untimely death had cut this seasoning period short. The younger Hanson became president when his father died and had exercised full control until he hired Mr. Wessling.

Mr. Paul Hanson knew that during 1954 he had made several poor decisions and noted that the morale of the organization had suffered, apparently through lack of confidence in him. When he received the profit and loss statement for 1954 (Exhibit 1), the net loss of over $170,000 during a good business year convinced him that he needed help. He attracted Mr. Wessling from a competitor by offering a stock option incentive in addition to salary, knowing that Mr. Wessling wanted to acquire a financial competence for his retirement. The two men came to a clear understanding that Mr. Wessling, as general man-

Exhibit 1

HANSON MANUFACTURING COMPANY

Profit and Loss Statement for Year Ending December 31, 1954

Gross sales		$10,589,405
Cash discount		156,578
Net sales		$10,432,827
Cost of manufacturing		7,529,758
Manufacturing profit		$ 2,903,069
Less: Selling expense	$1,838,238	
General administration	653,020	
Depreciation	458,440	2,949,698
Operating loss		$ 46,629
Less: Other income		21,065
Net loss before bond interest		$ 25,564
Add: Interest on bonds		145,283
Net Loss after All Charges		$ 170,847

Exhibit 2

HANSON MANUFACTURING COMPANY

Analysis of Profit and Loss by Departments, Year Ending December 31, 1954

	Product 101		Product 102		Product 103		Total (Thousands)	Direct	Allocated	Basis of Allocation
	(Thousands)	¢ per Cwt.	(Thousands)	¢ per Cwt.	(Thousands)	¢ per Cwt.				
Rent	$ 587	27.55	$ 457	44.43	$ 388	39.25	$ 1,432		x	Sq. ft.
Property taxes	62	2.93	50	4.85	40	4.05	152		x	Sq. ft.
Property insurance	52	2.45	40	3.87	53	5.33	145		x	Val. of equip.
Compensation insurance	83	3.87	57	5.58	45	4.55	185		x	Direct labor
Direct labor	1,293	60.63	890	86.42	687	69.65	2,870	x		
Indirect labor	398	18.65	273	26.48	212	21.52	883		x	Direct labor
Power	22	1.05	25	2.42	30	3.05	77		x	Machine hrs.
Light and heat	15	0.70	13	1.23	10	1.02	38		x	Sq. ft.
Building service	10	0.47	8	0.75	7	0.75	25		x	Sq. ft.
Materials	978	45.85	280	27.20	287	29.12	1,545	x		
Supplies	52	2.45	48	4.62	35	3.55	135	x		
Repairs	18	0.83	15	1.45	10	1.03	43	x		
Total	$3,570	167.43	$2,156	209.30	$1,804	182.87	$ 7,530			
Selling expense	910	42.70	458	44.45	470	47.62	1,838		x	$ val. of sales
General administrative	345	16.17	130	12.63	178	17.98	653		x	$ val. of sales
Depreciation	165	7.75	127	12.37	165	16.73	457		x	Val. of equip.
Interest	52	2.45	40	3.88	53	5.32	145		x	Val. of equip.
Total Cost	$5,042	236.50	$2,911	282.63	$2,670	270.52	$10,623			
Less: Other income	10	0.48	5	0.50	5	0.50	20		x	$ val. of sales
	$5,032	236.02	$2,906	282.13	$2,665	270.02	$10,603			
Sales (net)	5,167	242.35	2,599	252.28	2,667	270.27	10,433			
Profit or loss	$ 135	6.33	$ 307*	29.85*	$ 2	0.25	$ 170*			
Unit sales (in cwts.)	2,132,191		1,029,654		986,974					
Quoted selling price	$2.45		$2.58		$2.75					
Cash discounts taken (% of sales)	1.08%		2.03%		1.72%		1.48%			

* Loss.

Note: Figures may not check exactly because of rounding.

ager, had full authority to execute any changes he desired. In addition, Mr. Wessling would explain the reasons for his decisions to Mr. Hanson and thereby train him for successful leadership upon Mr. Wessling's retirement.

The Hanson Manufacturing Company made only three industrial products, 101, 102, and 103. These were sold by company salesmen for use in the processes of other manufacturers. All of the salesmen, on a salary basis, sold the three products but in varying proportions. The Hanson Company sold throughout New England and was one of eight companies with similar products. Several of its competitors were larger and manufactured a larger variety of products than did the Hanson Company. The dominant company was the Samra Company, which operated a branch plant in the Hanson Company's market area. Customarily, the Samra Company announced prices annually, and the other producers followed suit.

Price cutting was rare, and the only variance from quoted selling prices took the form of cash discounts. In the past, attempts at price cutting had followed a consistent pattern: all competitors met the price reduction, and the industry as a whole sold about the same quantity but at the lower prices. This continued until the Samra Company, with its strong financial position, again stabilized the situation following a general recognition of the failure of price cutting. Furthermore, because sales were to industrial buyers and because the products of different manufacturers were very similar, the Hanson Company was convinced it could not individually raise prices without suffering volume declines.

During 1954 the Hanson Company's share of industry sales was 12 per cent for type 101, 8 per cent for 102, and 10 per cent for 103. The industry-wide quoted selling prices were $2.45, $2.58, and $2.75, respectively.

Mr. Wessling upon taking office in February, 1955, decided against immediate major changes. Rather he chose to analyze 1954 operations and to wait for results of the first half of 1955. He instructed the accounting department to provide detailed expenses and earnings statements by products for 1954 (see Exhibit 2). In addition he requested an explanation of the nature of the costs including their expected future behavior (see Exhibit 3).

To familiarize Mr. Paul Hanson with his methods, Mr. Wessling sent copies of these exhibits to Mr. Hanson, and they discussed them. Mr. Hanson stated that he thought Product 102 should be dropped immediately as it would be impossible to lower expenses on Product 102 as much as 30 cents per cwt. In addition he stressed the need for economies on Product 103.

Exhibit 3

HANSON MANUFACTURING COMPANY

Accounting Department's Commentary on Costs

Direct Labor: Variable. Union shop at going community rates. No abnormal demands foreseen.

Compensation Insurance: Variable. Five per cent of direct and indirect labor is an accurate estimate.

Materials: Variable. Exhibit 2 figures are accurate. Includes waste allowances. Purchases are at market prices.

Power: Variable. Rates are fixed. Use varies with activity. Averages per Exhibit 2 are accurate.

Supplies: Variable. Exhibit 2 figures are accurate. Supplies bought at market prices.

Repairs: Variable. Varies as volume changes within normal operation range. Lower and upper limits are fixed.

General Administrative, Selling Expense, Indirect Labor, Interest, and Other Income: These items are almost nonvariable at levels of operation between $5 and $15 million.

Cash Discounts: Almost nonvariable. Average cash discounts taken are consistent from year to year. Percentages in Exhibit 2 are accurate.

Light and Heat: Almost nonvariable. Heat varies slightly with fuel cost changes. Light a fixed item regardless of level of production.

Property Taxes: Almost nonvariable. Under the lease terms Hanson Company pays the taxes; assessed valuation has been constant; the rate has risen slowly. Any change in the near future will be small and independent of production volume.

Rent: Nonvariable. Lease has twelve years to run.

Building Service: Nonvariable. At normal business level variances are small.

Property Insurance: Nonvariable. Three-year policy with fixed premium.

Depreciation: Nonvariable. Fixed dollar total.

Mr. Wessling relied on the authority arrangement Mr. Hanson had agreed to earlier and continued production of the three products. For control purposes he had the accounting department prepare monthly statements using as standard costs the costs per cwt. from the analytical profit and loss statement for 1954 (Exhibit 2). These monthly statements were his basis for making minor sales or production changes during the spring of 1955. Late in July, 1955, Mr. Wessling received from the accounting department the six months' statement of cumulative standard costs including variances of actual costs from standard (see Exhibit 4). They showed that the first half of 1955 was a successful period.

Exhibit 4

HANSON MANUFACTURING COMPANY

Profit and Loss Statement by Departments, at Standard, Showing Variations from January 1 to June 30, 1955

	Product 101		Product 102		Product 103		Total Standard (Thousands)	Total Actual (Thousands)	Variations + = Standard Exceeds − = Actual Exceeds
	Unit* Standard	Total at Standard (Thousands)	Unit* Standard	Total at Standard (Thousands)	Unit* Standard	Total at Standard (Thousands)			
Rent	¢ 27.55	$ 275	¢ 44.43	$ 316	¢ 39.25	$ 197	$ 788	$ 715	$ + 73
Property taxes	2.93	29	4.85	35	4.05	20	84	77	+ 7
Property insurance	2.45	25	3.87	28	5.33	27	80	73	+ 7
Compensation insurance	3.87	39	5.58	40	4.55	23	102	102	
Direct labor	60.63	604	86.42	615	69.65	349	1,568	1,582	− 14
Indirect labor	18.65	186	26.48	188	21.52	108	482	448	+ 34
Power	1.05	10	2.42	17	3.05	15	42	42	
Light and heat	0.70	7	1.23	9	1.02	5	21	20	+ 1
Building service	0.47	5	0.75	5	0.75	4	14	10	+ 4
Materials	45.85	457	27.20	194	29.12	146	797	788	+ 9
Supplies	2.45	24	4.62	33	3.55	18	75	75	
Repairs	0.83	8	1.45	10	1.03	5	23	25	− 2
Total	¢167.43	$1,669	¢209.30	$1,490	¢182.87	$ 917	$4,076	$3,957	$ + 119
Selling expense	42.70	426	44.45	317	47.62	239	982	923	+ 59
General administrative	16.17	161	12.63	90	17.98	90	341	328	+ 13
Depreciation	7.75	77	12.37	88	16.73	84	249	227	+ 22
Interest	2.45	25	3.88	28	5.32	26	79	73	+ 6
Total Cost	¢236.50	$2,358	¢282.63	$2,013	¢270.52	$1,356	$5,727	$5,508	$ + 219
Less: Other income	0.48	5	0.50	4	0.50	2	11	11	
	¢236.02	$2,353	¢282.13	$2,009	¢270.02	$1,354	$5,716	$5,497	$ + 219
Actual sales	242.35	2,416	252.28	1,796	270.27	1,355	5,567	5,567	
Profit or loss	¢ 6.33	$ 63	¢ 29.85†	$ 213†	¢ 0.25	$ 1	$ 149†	$ 70	$ + 219
Unit sales	996,859		712,102		501,276				

* Unit = Cwt.
† = Loss.

During the latter half of 1955 the sales of the entire industry weakened. Even though the Hanson Company retained its share of the market, its profit for the last six months was small. In January, 1956, the Samra Company announced a price reduction on Product 101 from \$2.45 to \$2.25 per cwt. This created an immediate pricing problem for all its competitors. Mr. Wessling forecast that if the Hanson Company held to the \$2.45 price during the first six months of 1956, their unit sales would be 750,000 cwt. He felt that if they dropped their price to \$2.25 per cwt. the six months' volume would be 1,000,000 cwt. Mr. Wessling knew that competing managements anticipated a further decline in activity. He thought a general decline in prices was quite probable.

The accounting department reported that the standard costs in use would probably apply during 1956, with two exceptions: materials and supplies would be about 5 per cent below standard; and light and heat would decline about one third of 1 per cent.

Mr. Wessling and Mr. Hanson discussed the pricing problem. Mr. Hanson observed that even with the anticipated decline in material and supply costs, a sales price of \$2.25 would be below cost. Mr. Hanson therefore wanted the \$2.45 price to be continued since he felt the company could not be profitable while selling a key product below cost.

Questions

1. Was Mr. Wessling correct in his decision not to drop Product 102 in the spring of 1955?
2. In January, 1956, should the company have reduced the price of Product 101 from \$2.45 to \$2.25 or to an intermediate figure?

CASE 17–4. ATHERTON COMPANY

Early in January, 1956, the sales manager and controller of the Atherton Company met for the purpose of preparing a joint pricing recommendation for Item 345. After the president approved their recommendation, the price would be announced in letters to retail customers. In accordance with company and industry practice, announced prices were adhered to for the year unless radical changes in market conditions occurred.

The Atherton Company was the largest company in its segment of the textile industry; its 1955 sales had exceeded \$6 million. Company salesmen were on a straight salary basis, and each salesman sold the full line. Most of the Atherton competitors were small. Usually they waited for the Atherton Company to announce prices before mailing out their own price lists.

Item 345, an expensive yet competitive fabric, was the sole product of a department whose facilities could not be utilized on other items in the product line. In January, 1954, the Atherton Company had raised its price from $1.50 to $2.00 per yard. This had been done to bring the profit per yard on Item 345 up to that of other products in the line. Although the company was in a strong position financially, considerable capital would be required in the next few years to finance a recently approved long-term modernization and expansion program. The 1954 pricing decision had been one of several changes advocated by the directors in an attempt to strengthen the company's working capital position so as to insure that adequate funds would be available for this program.

Competitors of the Atherton Company had held their prices on products similar to Item 345 at $1.50 during 1954 and 1955. The industry and Atherton Company volume for Item 345 for the years 1950–55, as estimated by the sales manager, is shown in Exhibit 1. As shown by this exhibit, the Atherton Company had lost a significant portion of its former market position. In the sales manager's opinion, a reasonable forecast of industry volume for 1956 was 700,000 yards. He was certain that the company could sell 25 per cent of the 1956 industry total if the $1.50 price was adopted. He feared a further volume decline if the competitive price was not met. As many consumers were convinced of the superiority of the Atherton product, the sales manager reasoned that sales of Item 345 would probably not fall below 75,000 yards, even at a $2.00 price.

Exhibit 1

ATHERTON COMPANY

Prices and Production, 1950–55, Item 345

Years	Physical Volume of Production (Yards)		Price Charged by Most Competitors	Atherton Company Price
	Industry Total	Atherton Item 345		
1950	610,000	213,000	$2.00	$2.00
1951	575,000	200,000	2.00	2.00
1952	430,000	150,000	1.50	1.50
1953	475,000	165,000	1.50	1.50
1954	500,000	150,000	1.50	2.00
1955	625,000	125,000	1.50	2.00

During the pricing discussions, the controller and sales manager had considered two other aspects of the problem. The controller was concerned about the possibility that competitors would reduce their prices below $1.50 if the Atherton Company announced a $1.50 price for Item 345. The sales manager was confident that competitors would not go below $1.50 because they all had higher costs and several of them were in tight financial straits.

The controller prepared estimated costs of Item 345 at various volumes of production (Exhibit 2). These estimated costs reflected current labor and material costs. They were based on past experience except for the estimates of 75,000 and 100,000 yards. The company had produced more than 100,000 yards in each year since World War II, and prewar experience was not applicable due to equipment changes and increases in labor productivity.

Exhibit 2

ATHERTON COMPANY

Estimated Cost of Item 345 at Various Volumes of Production (per Yard)

	75,000	100,000	125,000	150,000	175,000	200,000
Direct labor	$0.400	$0.390	$0.380	$0.370	$0.380	$0.400
Material	0.200	0.200	0.200	0.200	0.200	0.200
Material spoilage	0.020	0.020	0.019	0.019	0.019	0.020
Department expense:						
Direct*	0.060	0.056	0.050	0.050	0.050	0.050
Indirect†	0.400	0.300	0.240	0.200	0.180	0.150
General overhead‡	0.120	0.117	0.114	0.111	0.114	0.120
Factory cost	$1.200	$1.083	$1.003	$0.950	$0.943	$0.940
Selling and administrative expense§	0.780	0.704	0.652	0.618	0.613	0.611
	$1.980	$1.787	$1.655	$1.568	$1.556	$1.551

* Indirect labor, supplies, repairs, power, etc.

† Depreciation, supervision, etc.

‡ 30 per cent of direct labor.

§ 65 per cent of factory cost.

Questions

1. How, if at all, did the company's financial condition relate to the pricing decision?
2. Which price, i.e., $1.50 or $2.00, should have been recommended?

CASE 17–5. ARGOT STEEL COMPANY

At its weekly meeting on May 12, 1953, the executive committee of the Argot Steel Company was considering a request from the Meeshan Company to alter a supply contract between the two firms. According to the existing contract, Argot was to supply Meeshan with 3,200 tons of finished cold rolled steel per month until August 1, 1954. The contract contained a per-ton price for each type or grade of steel and further stipulated that these prices would remain fixed for the duration of the contract. Prices per ton would remain unchanged even if amendments were made to the contract with respect to quantities supplied.

The Meeshan management requested that the contract be amended to the effect that Argot provide an additional 900 tons of finished steel per month starting on August 1, 1953. This additional tonnage would be supplied for at least one year, the remainder of the contract period. Since profit reports for the past two years indicated that Argot was losing money on its sales to Meeshan, the matter was considered important enough for consideration by the executive committee.

The Meeshan Company was one of the larger customers of Argot Steel. Because of the nature of Meeshan's products, their requirements for steel had declined only slightly during periods of business recession. Meeshan had experienced a steady growth since the early 1900's, and Argot had benefited from this growth by a continuous relationship established during World War I. Since 1930, Meeshan had purchased virtually all its cold rolled steel from Argot, and the Argot sales department was anxious to maintain such a relationship in the future. Meeshan did, however, purchase hot rolled products from other suppliers, and Argot understood that these suppliers were anxious to procure some of Meeshan's cold rolled business.

The Meeshan business had provided shipments and operating losses for Argot as follows:

	Shipments in Tons	*Loss per Ton*
1951 (full year)	37,984	$3.73
1952 (fourth quarter)	9,597	4.60
1953 (first quarter)	9,512	1.83

More detailed data on product shipments to Meeshan in the first quarter of 1953 are given in Exhibit 1. As noted in the exhibit, the Argot Steel Company sold five products to Meeshan. All of the steel sold to Meeshan was produced at Argot's finishing mill, which had been operating at full capacity since 1950.

Meeshan requested Argot to supply a total of 900 additional tons of Products A and B per month, over and above the 3,200 tons per month specified in the existing contract. The additional tonnage of Products A and B would be shipped in approximately the same proportions as these products had been supplied during the first quarter of 1953. These products were cold rolled sheet that could be produced on either hand rolling

Exhibit 1

ARGOT STEEL COMPANY

Profit (or Loss) on Argot Shipments to Meeshan Company
First Quarter, 1953

	Tons	Net Sales Revenue per Ton	Profit or (Loss) per Ton
Product A	1,580	$105.30	($5.40)
B	991	105.70	(5.61)
C	1,181	105.26	6.15
D	1,084	101.99	4.03
E	4,676	100.19	(3.21)
Total	9,512	$102.48	($1.83)

mills or automatic rolling mills. They were the least profitable of the items sold to Meeshan primarily because they were in fact finished by the costly hand rolling mill operation. The production of Meeshan Products A and B utilized the full capacity of the hand rolling mill facilities. The hand mill was used because there was currently no capacity available on the company's automatic cold rolling machinery.

If Argot were to operate somewhat below capacity, however, Products A and B could be shifted to automatic cold rolling mills and manufactured at significantly lower costs. It was the expectation of the Argot management that the company would, over the long run, operate at levels ranging from 85 per cent to 100 per cent of capacity approximately 30 per cent of the time and at levels ranging below 85 per cent of capacity approximately 70 per cent of the time.

Capacity which could be used to produce the additional Meeshan tonnage would become available on August 1, 1953. At that time a government contract calling for 1,500 tons per month of Product 4 would be completed. Since cold rolled steel was in short supply, the sales department believed the government business could be replaced with additional tonnage of any of the alternative products listed in Exhibit 2.

Members of the executive committee were furnished certain information compiled by the cost department and reproduced as Exhibits 1, 2, and 3. All cost figures used in preparing the exhibits were based on full costs; that is, they included material, labor, and an allowance for factory overhead and for selling, general, and administrative expenses. Profit (or loss) figures were the difference between these costs and net sales revenue per ton; they were therefore profits (or losses) before federal income taxes.

Exhibit 2

ARGOT STEEL COMPANY

Comparison of Profit (or Loss) on Meeshan and Alternative Business

	Actual Tons Shipped First Qtr., 1953	Profit or (Loss) per Net Ton	
		Actual First Quarter, 1953	Estimated at 85% Operations
Meeshan Business:			
Product A	1,580	($5.40)	$5.24*
B	991	(5.61)	0.69*
Subtotal A and B	2,571	($5.48)	$3.37*
C	1,181	6.15	5.90
D	1,084	4.03	4.03
E	4,676	(3.21)	(0.71)
Total Meeshan Business	9,512	($1.83)	$1.75
Alternative Tonnage†*:*			
Product 1	6,346	$ 2.00	$ 2.15
2	2,467	5.15	5.29
3	779	4.60	5.19
4	20,742	8.44	6.85
5	2,675	19.25	19.06
6	11,624	8.00	8.84
7	3,344	7.70	6.04
8	4,967	(3.67)	0.08
9	1,219	(4.85)	(2.02)
10	1,280	1.43	2.66
11	5,130	8.95	11.20
Total (For Products Listed)	70,085		

* Reflects savings accruing from rescheduling to lower cost facilities. Other data in this column assume production on same facilities used in first quarter, 1953.

† Meeshan Products C, D, and E and all alternative products were produced on automatic cold rolling machinery at both 100 per cent and 85 per cent capacity operations.

Exhibit 2 shows the relative profitability per ton for products sold to Meeshan and for certain other products that were processed on cold rolling machinery. These products do not represent the total output of the company; total output in the first quarter of 1953 was 103,000 tons of finished product. The data as given show (*a*) actual profit (or loss) in the first quarter of 1953 and (*b*) an estimate of what the profit (or loss) would be if the company operated at 85 per cent of capacity.

The figures for the first quarter of 1953 reflect the fact that Products A and B were produced on hand cold rolling machinery while all other products were produced on automatic equipment. Although no precise breakdown was available, it was estimated that the costs assigned to

Exhibit 3

ARGOT STEEL COMPANY

Determination of Profit at 85 Per Cent Operating Level on Products A and B

(Dollars per Net Ton)

	Product A	Product B	Total
First quarter, 1953, profit or (loss)	($ 5.40)	($5.61)	($5.48)
Profit changes between January, 1953, and 85% operations:			
Plus: Profit improvement through rescheduling to automatic mills	7.90	3.80	6.21
Plus: Elimination of excess costs and other charges at lower rate of operations	4.86	4.62	4.76
Less: Increased fixed expense per ton at lower rate of operations	(2.12)	(2.12)	(2.12)
Net change in profit rate	$10.64	$6.30	$8.85
Estimated profit at 85 per cent operations (Carried to Exhibit 2)	$ 5.24	$0.69	$3.37

Products A and B in the first quarter included roughly $10 per ton of fixed costs and that the costs assigned to the other products listed in Exhibit 2 included approximately $12 per ton of fixed costs. The tonnage figures, and the profit (or loss) figures per ton, were in terms of "equivalent tons"; that is, they were adjusted to allow for differences in time required to produce a ton of the different products. Therefore, it may be assumed that one ton of any product can be substituted for one ton of any other product listed on Exhibit 2.

Exhibit 3 shows the factors which were taken into account in adjusting the loss figures for the first quarter of 1953 to the figures shown in Exhibit 2 for operations at 85 per cent of capacity. First, there was a saving forecast for both Products A and B which would result if these products were shifted from hand to automatic rolling. Second, it would be possible to eliminate many excessive costs at a lower level of operations. These excessive costs resulted from above-normal purchases of coal and coke, abnormally high utilization of purchased scrap, and off-standard use of facilities. Offsetting these gains to some extent, however, would be increased fixed expenses per ton resulting from the lower rate of operations. On Exhibit 2, all profit (or loss) figures at 85 per cent capacity for both Meeshan and alternative tonnages have been adjusted to eliminate these excess charges and to reflect increased overhead expenses per ton.

Questions

1. Assume that you are a member of the executive committee and that the president of the company, who was chairman of the committee, required that a decision be reached during the meeting on May 12. How would you vote? Why?

2. If, instead of deciding the issue during the meeting of May 12, the president agreed to postpone the decision until a special meeting called for *two days* later (May 14), what additional information, if any, would you request be made available for that meeting? Why do you want this information?

CASE 17–6. LACKLIN AIRCRAFT COMPANY

On several occasions since late 1950 the Lacklin Aircraft Company had renewed contracts with the government for the manufacture of BF 2C bombers. In March, 1953, Mr. Fred Hill, one of the buyers for the Lacklin Aircraft Company, was trying to decide upon a fair price to offer the Heyler Company, a subcontractor, for the manufacture of guide strips for the bomb-bay doors, one of the many parts for the BF 2C bomber.

The guide strips, made of a special alloy steel, required difficult machining operations, first to fit the guide strips to the contour of the plane's fuselage, second to provide a groove along which rollers traveled, and third to cut down the weight of the guide strips by boring holes. Unusual accuracy was demanded in order to prevent the bomb-bay doors from jamming.

The Heyler Company had been subcontracting the manufacture of the guide strips since December, 1950, at which time its bid of $253 per ship set[3] for the 120 ship sets required was the lowest of the several bids considered. With each new order for the BF 2C bomber which the Lacklin company received from the government, Mr. Hill successfully negotiated new contracts for the manufacture of the guide strips with Mr. Wright, the Heyler Company salesman. During this period the Heyler Company continued to meet all quality standards and delivery schedules.

On each successive contract after the original one signed in December, 1950, Mr. Hill had applied an 80 per cent learning curve[4] to the price of the previous order, excluding the cost of raw material and also excluding profit. Mr. Hill assumed that the tooling cost incurred by the Heyler Company in manufacturing the guide strips was amortized over the cost of the original contract, and therefore he made no allowance for tooling cost in estimating the price of subsequent contracts. Although it appeared to Mr. Hill that Mr. Wright was not familiar with the use of learning curves in purchase contracting, Mr. Wright agreed to manufacture the guide strips at the prices quoted by Mr. Hill. As a result, the price paid per unit for the guide strips was lowered on each successive contract. The Heyler Company's production rate of guide strips was held essentially constant at eight per month. Application of the learning curve would not be valid if production was not reasonably steady.

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[3] A "ship set" is the set of guide strips required for one bomber.

[4] See Appendix, p. 389, for a description of learning curves.

In making his calculations of the price to offer the Heyler Company for the guide strips after the first contract had been fulfilled, Mr. Hill had to rely on his own estimates of the raw material price, the tooling cost, and the Heyler Company's profit. Mr. Hill knew from his previous experiences with the Heyler Company that this company would refuse to reveal its cost and profit figures. Because of his past experience in purchasing and the use of the learning curve, however, Mr. Hill was confident that his estimates were fairly accurate. The Lacklin Company's own man-hour records showed that an 80 per cent curve was appropriate for the production of similar guide strips for another type of bomber made in the immediate postwar period, and this led Mr. Hill to conclude that the same 80 per cent curve was applicable to the Heyler Company.

Breaking down the original bid of $253 per ship set, Mr. Hill estimated the profit was around $23, which was 10 per cent of total cost, and the raw material was about $40 per ship set. He estimated that the Heyler Company's tooling cost was in the neighborhood of $3,600 and that this had probably been amortized over the 120 ship sets ordered under the first contract.

In order to set up his 80 per cent curve to find the cumulative average price on which he could base his future price offers, Mr. Hill made the following calculations:

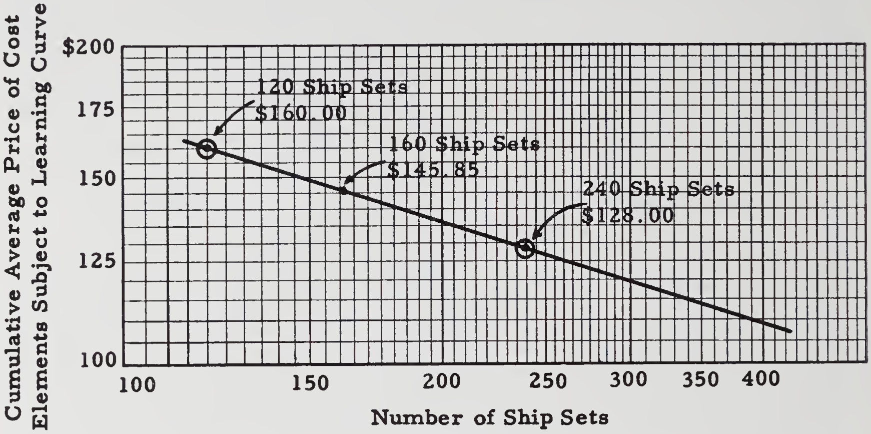
Original price		$253 per ship set
Less: Profit at 10 per cent of cost	$23	
Tooling cost on first order $3,600 ÷ 120 units	30	
Raw material cost per unit	40	
Items not subject to learning curve		93
Costs Subject to Learning Curve		$160

The adjusted costs of $160 per ship set for 120 units was plotted on log-log graph paper (see Exhibit 1). Mr. Hill then took double the quantity of the original order (or 240 units) and 80 per cent of the unit price ($128) and plotted his second point on the log-log graph paper. Through these two points a straight line was drawn.

Exhibit 1

LACKLIN AIRCRAFT COMPANY

Eighty Per Cent Learning Curve—BF 2C Bomber Guide Strips



When the Lacklin company signed the second contract calling for 40 more BF 2C bombers, Mr. Hill looked at his graph to find the new cumulative average price of cost elements subject to the learning curve for the total quantity of the old and new orders, which amounted to 160 ship sets. The new cumulative average price, as indicated by the graph, was $145.85 per ship set (see Exhibit 1). Using this information, Mr. Hill continued his calculations:

160 ship sets at $145.85 per set average for cost elements subject to learning curve	$23,336
Less: 120 units purchased at $160 per set average for cost elements subject to learning curve	19,200
Total Price to Be Paid on New Order for Cost Elements Subject to Learning Curve	$ 4,136

The new average price per ship set to be paid on the new order for the cost elements subject to the learning curve was found to be $4,136 ÷ 40 new ship sets, or $103.40. To this new price of $103.40 per ship set Mr. Hill added back in the cost items not subject to the curve which previously had been subtracted:

Cost elements subject to learning curve	$103.40
Plus: Raw material	40.00
Average price per unit before profit	$143.40
Plus: Profit at 10 per cent of cost	14.34
Total Price per Ship Set on the New Order	$157.74

Mr. Hill believed that this figure of $157.74 per ship set was quite adequate, and in his negotiations with Mr. Wright this figure was finally, but grudgingly, accepted.

In subsequent negotiations, the prices offered by Mr. Hill to the Heyler Company on successive contracts for the guide strips became lower and lower. Mr. Wright, the Heyler Company salesman, became more emphatic in his objections and warned Mr. Hill that "this learning curve business is going too far." Each time Mr. Hill asked to see the Heyler Company's cost data to justify some other price, Mr. Wright would give the same answer: "Our cost data is none of your business!"

On February 2, 1953, about one month before the final delivery of the latest order of guide strips, which had been contracted for in November, 1952, Mr. Wright complained that the Heyler Company had recently experienced an increase in raw material cost which added $2 to the cost per ship set. Furthermore, Mr. Wright stated that modifications in the design of the guide strips since the original contract had been signed had increased the raw material cost per ship set by another $3. These modifications in design, however, had not increased labor or overhead costs. Mr. Wright stated that because of these increased costs and the low $148.00 per ship set price paid by the Lacklin company for the currently produced guide strips, he was quite skeptical as to whether his company would take on any further contracts for guide strips, especially since at that time they could get all the business they wanted. He went on to say that his company was "sick and tired of producing guide strips at a loss for Lacklin and having to make up these losses out of contracts with other companies." While Mr. Hill felt that the raw material cost increases mentioned by Mr. Wright were correct, Mr. Hill did not have any way of appraising the validity of Mr. Wright's statements about the Heyler Company's losing money on this contract with the Lacklin Aircraft Company.

Two weeks after this conference between Mr. Hill and Mr. Wright, the Lacklin Aircraft Company negotiated a new contract with the government for additional BF 2C bombers, which would require 100 more ship sets of guide strips. Again Mr. Hill was confronted with the task of securing more guide strips. From December, 1950, to March, 1953, the Heyler Company would have produced 210 ship sets of guide strips. Over this period the price paid for the guide strips had decreased from $253 per ship set on the first order to $148.00 per ship set on the current order contracted for in November, 1952, and scheduled for completion within the next two weeks. The total price of the 210 ship sets *for the cost elements subject to the learning curve* was $28,060.20. This compares to $33,600 which would have been paid on 210 ship sets for these same cost elements if the learning curve had not been applied. A further saving to the Lacklin Company was realized because the profit which the Heyler Company received per unit was a fixed percentage of cost. Thus with the lower calculated cost per ship set based on the learning curve, the profit to the Heyler Company was cut substantially.

Despite these savings which had resulted from dealing with the Heyler Company, Mr. Hill realized that it was important to continue dealing with this particular company for the additional 100 ship sets of guide strips. Mr. Hill recalled that at 1950 price levels the Heyler Company's first bid of $253 per ship set was the lowest of the several bids submitted; the next lowest bid at that time was $272 per ship set. If the Heyler Company refused to accept any more orders, dealing with a new subcontractor would probably result in a substantial increase in the price for guide strips. Mr. Hill estimated that the lowest price for which he could currently purchase guide strips from another subcontractor would be in the neighborhood of $280 per ship set (including the amortized cost, over 100 ship sets, of new tooling). Furthermore, Mr. Hill considered the Heyler Company an excellent source of supply because it produced a satisfactory product and always met its delivery schedule.

On the other hand, Mr. Hill knew that the validity of the learning curve had been widely accepted in the aircraft industry and that it was especially applicable to the manufacture of parts such as guide strips, for which direct labor was the major cost component. Furthermore, it was his job as a purchasing agent for the Lacklin Aircraft Company to get as low a price as possible commensurate with a satisfactory product.

Mr. Hill had an appointment with Mr. Wright, the Heyler Company salesman, the next day, at which time they would open negotiations for the 100 additional ship sets of guide strips. Mr. Hill knew that Mr. Wright would suggest a substantial upward revision in the price.

Questions

1. If he used the 80 per cent learning curve, what price would Mr. Hill calculate for the new order of 100 ship sets?
2. What price *should* Mr. Hill use as a basis for his negotiations?
3. What is the highest price that should be paid to the Heyler Company for the guide strips?
4. What are the implications of the use of learning curves in purchasing contracting to both the prime contractor and the subcontractor?

5. In what situations would the use of the learning curve in purchase contracting not be used?

APPENDIX

THE USE OF LEARNING CURVES IN PURCHASE CONTRACTING

The basis for negotiating a lower price on each successive contract for a specific product rests on the assumption that certain costs decrease as the workers and their supervisors become more familiar with the work; as the flow of work, tooling, and methods improve; as less scrap and rework result; as fewer skilled workers need be used; and so on. The decreasing costs are a function of the learning process which results in fewer and fewer man-hours being necessary to produce a unit of product as more units of the same product are completed. It should be noted, however, that not all costs decrease; for instance, material costs are not usually subject to the learning process, although they may decrease to the extent to which waste is eliminated. Packaging and trucking costs are other examples of costs that usually are not subject to the learning process.

Studies have been made of this decreasing cost concept, and the results have shown that in certain industries over a period of time an average rate of decrease for costs which vary with the learning function is fairly typical of the experience of the individual companies making up that industry. This average industry rate, however, may not be the best rate for specific products.

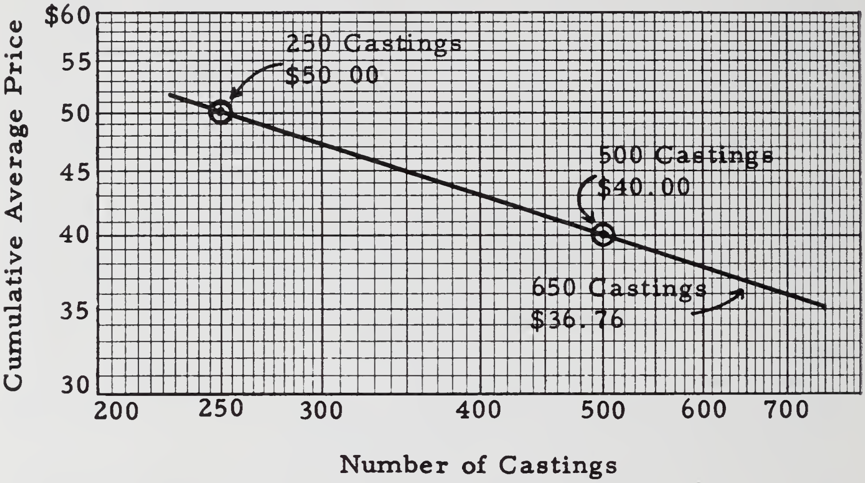
In the aircraft industry, which is continually involved in new and redesigned planes and parts, the use of the principle of decreasing costs based on the learning function is widely regarded as being appropriate in many situations. The job of estimating future costs and prices on new and modified aircraft components is difficult because of the scarcity of usable historical cost data, and for this reason the aircraft industry has done some research in the use of learning curves for estimating costs in setting purchase contract prices. Besides their use in negotiating purchase contracts, learning curves have been used for other planning purposes such as scheduling and developing labor loads, area and equipment requirements, shop efficiency measures, budgets, and sometimes standards.

The research done in the aircraft industry indicates that there is probably an average learning curve rate which can be applied to the increase in production efficiency, in so far as costs subject to the learning function are concerned. This rate approximates an "80 per cent curve," which means that when quantities of production are doubled on an item, cumulative average man-hours per unit should be reduced 20 per cent. As an illustration of this concept, assume that a company has purchased 250 machined castings at $50 each from XYZ Company. To simplify this case, assume further that material costs are insignificant and that the elements of labor, overhead, selling, and administration expense and profit, which make up the $50 per unit price, all vary in relation to the man-hours required to produce one machined casting; that is to say, all the elements of the $50 price are subject to the learning curve. Before production of the 250 castings has been completed, another 400 castings of the same type are ordered from the XYZ Company. What price should be paid for the additional 400 castings?

Assuming that an "80 per cent curve" can be applied in this situation, the $50 price is plotted at the 250-unit quantity level on log-log graph paper (see Exhibit 1). The second point on the graph is established at double the quantity and 80 per cent of the price of the first order. A straight line is drawn through and extended past these two points. (Log-log graph paper shows the 80 per cent curve as a straight line, whereas arithmetic graph paper shows the 80 per cent curve as a complex curve which is difficult to plot.) Adding together the quantities of the old and new orders (250 plus 400 units), the cumulative average price for the total units is $36.76 per unit as indicated on Exhibit 1. Multiplying the total quantity of 650 units by the new cumulative average price of $36.76, the *total price* for *both* orders of $23,894.00 is derived. Because the first order of 250 castings cost in total $12,500, this is subtracted from the total price of both orders. The remaining $11,394.00 is divided by the number of units to be purchased in the new order (400) which gives the per unit price of $28.48 to be paid for the new castings.

Exhibit 1

EIGHTY PER CENT LEARNING CURVE—MACHINED CASTINGS



While it may be demonstrated in many situations that the learning curve applies to direct labor costs,[5] the learning curve usually cannot be applied to raw material costs. Overhead costs present another problem. Many overhead costs are allocated to specific jobs on a per-labor-hour basis, and the allocated cost therefore varies with direct labor hours. On the other hand, certain overhead costs, such as tooling,[6] crating, and shipping costs, do not vary with direct labor hours and therefore are not subject to the learning curve. The per-unit costs of these latter items should be subtracted from the total per-unit cost of the product before any calculations are made with the other costs that *are* subject to the learning process.

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[5] Direct labor costs usually vary proportionately with direct labor hours except where piece rates or other incentive plans are in effect.

[6] It is common in the aircraft industry to purchase tooling separately.

Selling and administrative costs present similar problems. Many selling and administrative costs vary roughly in relation to direct labor hours or are allocated to products on the basis of direct labor hours. All selling and administrative costs are often assumed to be subject to the learning curve.

In the case of both overhead costs and selling and administrative costs, the costs actually incurred may not vary with direct labor hours even though they are allocated on this basis. Nevertheless, if the allocated costs are used as a basis for pricing, as is often the case, it can be argued that it is proper to treat them as variable for the purpose of pricing decisions.

The procedure for handling the items of cost *not* subject to the learning curve, such as raw material, tooling (if any), and shipping costs, is to deduct these items from the total contract price prior to making any computations using the learning curve. The remaining costs, then, can be subjected to the calculations using the learning curve (as explained above). When the new figure for the cost elements subject to the learning curve is calculated, the fixed per unit cost elements, previously subtracted, are added back in to arrive at a total cost figure.

With regard to the profit element, the usual procedure is to deduct the amount from the total selling price, along with the raw material and other fixed per unit costs, before making the computations based on the learning curve. After the new figure for the cost elements subject to the learning curve is derived, the profit per unit is added back to make up the balance of the total per unit price along with the other fixed per unit costs (e.g., raw material, etc.). The profit figure added back in is not necessarily the same amount as the profit figure previously subtracted. The profit figure added back in might be reduced in amount since it is customary in many situations to calculate profit as a percentage of cost.

Chapter

18

PLANNING CAPITAL ACQUISITIONS

Of the several types of project planning problems, those involving the investment of funds in fixed assets are at once the most important and the most difficult. These problems are important, not only because they involve large sums of money but also because the decision may influence the whole conduct of the business for years to come. A decision to build a new plant, for example, tends to commit a company to a certain locality and to a certain character and size of manufacturing effort for the life of the plant. The special difficulty of capital investment problems arises because of the necessity of making allowances for differences in the timing of the various cost and revenue elements.

Any investment involves the commitment of funds *now* with the expectation of earning a satisfactory return on these funds over a period of time in the future. The word "investment" immediately calls to mind the commitment of funds to stocks or bonds. The commitment of funds to land, buildings, equipment, and other types of fixed assets, however, has the same essential characteristic as a financial investment; namely, that the commitment is made with the expectation of earning a satisfactory return in the future.

Illustrative of these fixed asset, or "capital budgeting" problems, are the following:

1. *Expansion.* Shall we build or acquire a new plant? (The expected return on this investment is the profit from the products produced in the new plant.)

2. *Replacement.* Shall we replace existing equipment with more efficient equipment? (The expected return on this investment is the savings resulting from lower operating costs, or the profit from additional volume produced by the new equipment, or both.)

3. *Choice of Equipment.* Which of several proposed items of equipment shall we purchase for a given purpose? (The choice often turns on

which item is expected to give the largest return on the investment made in it.)

4. *Buy or Lease.* Having decided to acquire a building or a piece of equipment, should we lease it or should we buy it? (The choice turns on whether or not the investment required if the asset is purchased will yield an adequate return as compared with leasing.)

The same general approach can be used for all these problems. In Part I of this chapter the essential elements of the approach are discussed, and techniques for solving the problem are described in terms of the simplest possible fact situation. In Part II, certain common variations from this simple situation are described. The whole chapter constitutes only an introduction to the topic. For a more complete discussion, the student is referred to the references given at the end.

For ease of exposition, we shall assume throughout that the objective of the business is to maximize profits, although, as pointed out in Chapter 17, it must be recognized that other objectives may be equally important, or more important, in practical situations. All the comments in Chapter 17 about the types of costs that should be used in alternative choice problems are also relevant here.

I. GENERAL FRAMEWORK OF ANALYSIS

In order to simplify the discussion, Part I deals only with the *equipment replacement* problem and with the simplest version of this problem, which is the choice between two alternatives: (*a*) to keep on using existing equipment, or (*b*) to acquire a specified item of new equipment. This problem arises when a new machine is proposed as a replacement for a machine that has not reached the end of its physical life. (If the present machine has reached the end of its physical life, there is no choice but to replace it, and there is therefore no point in applying the techniques discussed here.)

In any problem involving the acquisition of fixed assets, it is useful to distinguish between two types of cost: *continuing costs or savings* and *"one-shot" or investment costs.*

Annual Savings

Continuing costs are those that are expected to go on, year after year, as the machine is used. They include items such as labor, material, power, repairs, insurance, and other recurring expenses. Most cost items in this category will be the same in each year of the machine's useful life—or at least in making cost estimates, we can do no better than to assume that they will be the same. Therefore, if these costs are estimated for one year, we can reasonably assume that they will be about the same in every other year of the machine's life. (There are many situations where these continuing costs—especially repairs and maintenance—vary from year to year. Some of these are discussed in Part II.)

Suppose that the proposed machine is under consideration as a means of reducing operating costs. If the present machine is continued in use, there will be a certain set of annual costs associated with using it. If the proposed machine is purchased, there will be a different, and presumably lower, set of annual costs. The difference between these two sets of costs is the *annual savings* estimated if the proposed machine is acquired.

If the proposed machine is intended to increase production, then there will be additional annual *profits* associated with it. These profits have the same characteristic as the savings mentioned above; namely, they are expected to recur, year after year, over the economic life of the machine.

Investment Costs

"One-shot" or investment costs are the costs that are incurred just once during the time span of the proposal, usually at the time the machine is acquired. Examples are the cost of the machine itself, its shipping cost, and the cost of installation. Proceeds realized from the sale of existing equipment and anticipated proceeds from the disposition of the proposed equipment at the end of its useful life are also items that occur just once rather than continuously.

Comparing Annual Savings with Investment

If he purchases the machine, the businessman is making an investment. The funds so invested are tied up, or frozen, until they can be gradually liquidated through the profitable operation of the machine. Any investment involves a risk, and even if the money to finance the purchase is borrowed, it is the owner of the machine who incurs the risk. A businessman will ordinarily not risk funds in an investment unless he believes that he will obtain a satisfactory return on these funds.

Since the proposed equipment will have annual operating savings as compared with the present equipment, but will demand an investment that will not be required if use of the present equipment is continued, the issue to be resolved in an equipment replacement problem is *whether the investment in the proposed equipment is justified by the savings.* The techniques to be described are methods for comparing these essentially unlike elements: (1) the stream of annual savings and (2) the single lump-sum investment.

In making a figure analysis, therefore, the first step is to find two figures, here called the "annual operating savings" (OS) and the "net investment" (NI).

Annual Operating Savings. This is the sum of the differences in real operating costs between the proposed equipment and the present equipment. These costs may include labor, material, power, repairs, and any other item that will be different under one alternative from what they would be under the other. (Interest and depreciation are specifically excluded from this definition. Interest is discussed separately below. Depreciation on existing equipment is not a relevant cost, as explained in Chapter 17. Depreciation on the proposed equipment is not relevant since the investment itself will be treated as a separate item.) The general practice is to use one year as the time period for which the costs are estimated because the rates of return and other measures that emerge from the formulas to be described are ordinarily expressed as annual figures.

Net Investment. This is the amount of new funds required to purchase and install the new equipment, over and above funds expected to be realized from the sale of the present equipment.[1]

Three common techniques for comparing annual operating savings with the net investment will be described:

1. Payback method
2. Unadjusted return on investment method
3. Time adjusted return on investment method

To illustrate the three methods, let us assume a machine replacement proposal where the net investment is $1,000 and the estimated annual operating savings are $200.

Payback Method

The simplest version of the payback method is to divide the net investment by the annual operating savings; that is, $NI \div OS$. For our illustrative situation, this is $1,000 ÷ $200 = 5 years.

The figure that results from the payback equation is a certain number of years, and it means that *if* no better alternative comes along in the meantime and *if* the cost estimates are valid, the net investment will be recouped by the end of this number of years. Some companies have a policy that they will replace equipment only when a payback period of not longer than 1, 2, 3, or 5 or some other specified number of years can be demonstrated. In addition to all the judgments that must be made in making the cost estimates, this technique also requires that judgment be exercised in deciding what payback period to accept.

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[1] The problem of the salvage value of the proposed equipment, which may also enter into the calculation of the net investment, will be discussed in Part II.

Significance of the Payback Method. The payback period does *not* measure the return on the investment; that is, it does not show how much will be earned over the whole life of the investment. It is useful mainly in considering the cash flow or liquidity position of the company and when considering the rate of technological change for the particular type of equipment under consideration. When a company is in a tight cash position or is worried that the investment will become obsolete in a short period of time, the payback figure is relatively more important than otherwise. However, it should be noted that a proposal with a short payback time may sometimes be less desirable than another proposal with a longer payback time since the latter proposal may have a longer useful life and thus may earn more than the former proposal over its total life.

Despite its limitations, the payback figure is widely used. It can be calculated so easily that it provides a quick method of testing proposals and of eliminating those that are obviously unattractive, thus reducing the number that must be subjected to more elaborate analysis.

Unadjusted Return on Investment

There are many ways of defining "return on investment," and for each definition there is a different formula. One frequently used formula is:

$$\left(OS - \frac{NI}{n}\right) \div \frac{NI}{2}.$$

The n in this formula is the number of years over which the investment is to be recovered, which corresponds to the economic life of the machine, a concept that is explained below. The amount NI/n, which is subtracted from the annual operating savings, is an allowance for recovering the cost of the investment; the remainder is the annual return that is expected to result after provision for this recovery has been made.

The return is figured as a percentage of the *average* investment ($NI/2$), rather than as a percentage of the total investment (NI). The funds originally frozen in the investment are gradually liquidated as the savings are realized, so that eventually the amount of funds so frozen drops to zero. On the average, over the life of the investment, approximately half the funds originally committed to the machine are tied up at any one time.

Using our example, and assuming that the economic life of the machine is estimated to be ten years, the formula works out as:

$$\left(200 - \frac{1{,}000}{10}\right) \div \frac{1{,}000}{2} = 100 \div 500 = 20 \text{ per cent.}$$

Significance of the Unadjusted Return Method. This formula gives a percentage return which means, roughly, that the alternative is more attractive than other possible uses of funds that yield a lower return (in the example, lower than 20 per cent). Although the formula gives a satisfactory approximation to the true return for short-lived investments, for longer-lived investments it results in a significant overstatement of the return. For extremely long-lived assets, the formula gives double the true return. This overstatement arises because the formula makes no allowance for the difference between the timing of the investment and the timing of the stream of savings, as will be explained.

The unadjusted return method treats each year's savings as if it were as valuable as every other year's; whereas, actually, the prospect of saving $200 next year is more attractive than the prospect of saving $200 two years from now, and *that* $200 is more attractive than the prospect of saving $200 three years from now, and so on. Furthermore, this method makes a direct comparison between a sum of money laid out today and a stream of savings to be realized over a number of years in the future, but the fact is that the dollar amounts involved in the two sides of this comparison are not the same kind of dollars. In financial language, the unadjusted formula does not discount the stream of future savings so as to reduce these savings to their present value.

The Concept of Present Value

Table A (p. 495) shows the present value of one dollar received at various times in the future, at various rates of discount. For example, the first figure under the 10 per cent discount column is 0.909, which means that the present value of $1 to be received a year from now is $0.909. In other words, using a rate of 10 per cent, $0.909 on hand today is equivalent to the promise of receiving $1 a year from now; $0.826 (the next figure in the 10 per cent column) on hand today is equivalent to the promise of $1 two years from now; $0.751 on hand today is equivalent to the promise of $1 three years from now; and so on. The figures in Table A were computed from the formula:

$$\frac{1}{(1+i)^n},$$

where i is the interest rate and n is the number of years.

It may help to understand these figures if you trace some of them through. For example, using the 10 per cent column, see what would happen if you invest $0.909 today at 10 per cent interest. At the end of one year, interest of $0.0909 would be earned, and your total amount would therefore grow to $0.999, or practically $1. Or if you invest $0.826 today at 10 per cent, it would earn $0.0826 interest in the first year, and would therefore increase to $0.9086; during the second year you would earn 10 per cent of the $0.9086, or $0.09086, so that by the end of the second year the total would have increased to $0.99946, or practically $1. Tracing through any other figure in Table A will produce the same result; namely, the final figure will be practically $1.

Application of Present Value Concept. Applying this concept to our illustrative situation, we can compare the $1,000 to be invested today with the stream of annual savings of $200 by adjusting each of the $200 savings to its present value. Assuming that these savings will be realized for each of the next ten years, and assuming that the company expects to earn 10 per cent on its investment, the present value of this stream of savings can be calculated as shown in Illustration 18–1.

Illustration 18–1

CALCULATION OF PRESENT VALUE OF $200 PER YEAR FOR TEN YEARS AT 10 PER CENT

Year	Savings in That Year (*a*)	10% Discount Factor* (*b*)	Present Value (*a* × *b*)	Cumulative Present Value
First	$200	0.909	$182	$ 182
Second	200	0.826	165	347
Third	200	0.751	150	497
Fourth	200	0.683	137	634
Fifth	200	0.621	124	758
Sixth	200	0.564	113	871
Seventh	200	0.513	103	974
Eighth	200	0.467	93	1,067
Ninth	200	0.424	85	1,152
Tenth	200	0.386	77	1,229

* From "10 per cent" column in Table A.

This calculation shows, for example, that $200 to be earned a year from now has a value *today* of only $182 (at a discount rate of 10 per cent) and that $200 to be earned two years from now had a value *today* of only $165. Thus, if the $200 is earned for each of two years, the present value of these future earnings is the sum of the above figures, or $347. Continuing this process for ten years, we find that the total present value of the stream of future earnings is $1,229. Since this amount is more than the $1,000 investment, the investment is warranted, if our assumptions turn out to be correct.

Note also from Illustration 18–1 that by the end of the eighth year the cumulative present value of the savings has exceeded $1,000. This shows that if the machine is used for at least eight years, the company will earn approximately the desired rate of 10 per cent. This is so because at a rate of 10 per cent, the cumulative present value of the stream of savings of $200 a year for eight years is approximately $1,000.

Check on the Computation. The present-value concept may be clarified if we verify the statement that income of $200 a year for eight years is a return of approximately 10 per cent on a $1,000 investment. This is done in Illustration 18–2.

Illustration 18–2

CALCULATION OF RETURN ON $1,000 INVESTMENT

Year	Total Income (*a*)	Earnings at at 10% of Principal (*b*)	Balance, to Apply against Principal (*a* − *b*)	Principal, End of Year
0	$...	$	$	$1,000.00
First	200	100.00	100.00	900.00
Second	200	90.00	110.00	790.00
Third	200	79.00	121.00	669.00
Fourth	200	66.90	133.10	535.90
Fifth	200	53.59	146.41	389.49
Sixth	200	38.95	161.05	228.44
Seventh	200	22.84	177.16	51.28
Eighth	200	5.13	194.87	0

This calculation shows that an income of $200 for eight years would provide a return of 10 per cent on the amount tied up each year, would provide for recovery of the investment itself, and would provide a little extra (the extra amount reflects the fact that the return is slightly more than 10 per cent). Another way of looking at these figures is to say that the company would be about as well off with $1,000 on hand today as it would be with an opportunity to earn $200 a year for the next eight years, if it expects to earn 10 per cent on its investment.

Present Value of a Stream of Payments

Table B (p. 496) has, for many problems, a more convenient set of present-value figures than those in Table A. It shows the present value of $1 received annually for *each* of the next *n* years. Each figure on Table B was obtained simply by cumulating, i.e., adding together the figures for the corresponding year and all preceding years in the same column on Table A.

Table B can therefore be used directly to find the present value of a stream of equal payments received annually for any given number of years. Instead of going to the trouble of computing the present value of $200 for each of the ten years separately, as was done in Illustration 18–1, the same result could have been obtained by multiplying $200 by 6.145, the figure obtained directly from Table B.

One other table, Table C, is given on page 497. This table shows the present value of a stream of payments of $1/12 per month for *n* years. The assumptions on which it was constructed differ slightly from those implicit in Table B. In Table B it is assumed that the $1 is received in a single payment on the last day of each year. In Table C it is assumed that earnings are $1/12 per *month* throughout the period. In both tables, interest on these earnings is compounded annually. Although the savings we have been discussing have been expressed in annual terms, these savings actually flow in throughout the year—some weekly or biweekly in the form of lower payrolls, some monthly in the form of lower utility bills, and some at irregular intervals. Taking them all together, it is believed that the assumption that, on the average, they occur at monthly intervals is often as good an assumption as can be made.

Summary of the Present Value Tables

In summary:

Use *Table A* to find the present value of a single payment to be received *n* years from now.

Use *Table B* to find the present value of a stream of uniform payments to be received at the end of each year for the next *n* years.

Use *Table C* to find the present value of a stream of uniform payments to be received approximately every month for the next *n* years.

In the examples that follow, Table C, rather than Table B, is used for all calculations involving a stream of payments.

The Time-Adjusted Return on Investment

The time-adjusted rate of return on the investment we are using as an illustration can be obtained by inspection of Table C by the following process:

1. Divide the net investment, $1,000, by the annual operating savings, $200.
2. Locate the resulting factor, 5.0, on the ten-year row of Table C. The column where the figure closest to 5.0 appears shows the approximate rate of return. In the 16 per cent column, the figure is 5.178; in the 18 per cent column, it is 4.854. The rate of return for a factor of 5.0 lies between these two percentages, and it is therefore approximately 17 per cent.

The factor, 5.0, shows the number of times that the net investment exceeds the operating savings. Each figure on Table C shows the number of times the present value of a stream of savings exceeds an investment of $1 made today for various combinations of interest rates and numbers of years. The figure, 5.0, opposite any combination of years and interest rates means that the present value of a stream of savings of $1 a year for that number of years discounted at that interest rate is $5. The present value of a stream of savings of $200 a year is 200 times $5, or $1,000.

Note that the factor 5.0 is the same as the "payback period" described above. *Table C can be viewed as a device for translating the payback period into a rate of return on the investment under a specified assumption as to the life of the investment.*

Since the economic life of the machine and the rate of return are often the most uncertain parts of the problem, it is often useful to locate several combinations of economic life and earnings rates that will have the specified factor. Some of the combinations found on Table C for a factor of 5.0 are:

If the Useful Life Is—	Then the Rate of Return Is about—		If the Required Rate of Return Is—	Then the Useful Life Must Be at Least—
6 years	6%	*Or*	6%	6 years
8 years	14%	*figured*	10%	7 years
10 years	17%	*another*	15%	9 years
12 years	19%	*way:*	20%	14 years

If the proposed investment has a longer economic life, *and* if the required earnings rate is lower than any one of the combinations selected, the investment is attractive; otherwise, it is not attractive.

In using the table, you will usually find it necessary to interpolate, that is, to estimate the location of a number that lies between two figures appearing in the table. There is no need to be precise about these interpolations because the final result is no better than the basic data, and the basic data are ordinarily only rough estimates. A quick interpolation, made visually, is usually as good as the accuracy of the data warrants.

Economic Life

Having mentioned the uncertainty inherent in the estimate of economic life in the above calculations, it seems desirable to give some special consideration to this item.

There are at least three ways of defining the "life" of a machine:

1. Its physical life
2. Its technological life
3. Its product-market life

The economic life, which is the relevant life for the problem we are studying, is the *shortest* of these three types of life. Economic life can never be estimated exactly, but it is extremely important that careful consideration be given to making the best possible judgment about it.

Physical Life. There is a tendency, when thinking about the life of a machine, to consider primarily its *physical life;* that is, the number of years the machine will probably be of use to the company in performing the technical job for which it was purchased. This concept of "life" is sometimes used in calculating depreciation for accounting purposes and for income tax purposes.[2] It is of little use in investment decisions.

Technological Life. This refers to the period of time that elapses before a new machine comes out that makes the present machine obsolete. It is this life that, for most companies, corresponds to the economic life. Improvements will almost certainly be made sometime in all machines now in existence, but the question of *which* machines will be improved and *how soon* the improved machines will be on the market is a most difficult one to answer. Unless special information is available, the answer can be little more than a guess. Yet it is a guess that must be made, for the investment in a machine will cease to earn a return when and if this machine is replaced by an even better machine.

Product-Market Life. Although the machine may be in excellent physical condition, and although there may be no better machine on the market, its economic life has ended, as far as the owner is concerned, as soon as the company ceases to market the product made on the machine. The "product-market" life of the machine may end because the particular operation performed by the machine is made unnecessary by a change in style or a change in process, or because the market for the product itself has vanished. A machine for making buggy whips may last physically for 100 years, and there may be no possibility of making technological improvements in it, yet such a machine cannot earn a return on its investment if the buggy whips produced on it cannot be sold.

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[2] Although both accounting principles and income tax laws permit equipment to be depreciated over its "useful life," which means economic life, some accountants and internal revenue agents rely heavily on estimates of physical life.

The product-market life of a machine also ends if the company goes out of business. Most managements quite properly operate on the premise that the company will be in business for a long time to come. There are instances, however, where a businessman foresees an end to his business, or to a particular part of it, in the relatively near future. In such a case, the economic life of a machine *to him* is limited to the period during which he believes his business is going to operate.

Required Earnings Rate

The other factor to which special attention should be given is the earnings rate that is required on an investment of the type under consideration. The selection of the appropriate rate is a crucial matter of top management judgment. The problem of deciding the appropriate rate can usefully be subdivided into two parts: (1) selection of the average rate required on all investments and (2) consideration of factors that make the proposed investment different from the average.

The Average Earnings Rate. One way of estimating the average earnings rate is to find the average earnings expected on funds now invested in the company. In some situations this is approximately the ratio of net profit after taxes (but before interest on fixed debt) to the total of fixed debt plus owners' equity. Such an approximation is useful only if present earnings are considered to be satisfactory. Another approach is to consider the firm's *cost of capital,* which is a weighted average of the cost of interest on borrowed funds and the cost that would be incurred in raising funds through the sale of stock at a price that would not dilute the equity of the present owners.

Whatever the rate selected, it is almost certain to be considerably higher than an *interest* rate; that is, the rate for borrowing money (say 4 per cent or 5 per cent). The required earnings rate used includes interest, but it also includes an additional allowance for risks that are borne by the business rather than by the lender of money, and for which the business expects compensation.

Adjustment of the Average Rate. The required earnings rate for the whole business reflects the average risk of investments in various classes of assets. This average results from a composite of many different types of risks, ranging from investments in government bonds, where the risk is very low, to investments that may be almost pure gambles, such as those in certain new products. The earnings rate required on the particular investment under consideration should reflect, if feasible, the relative risk of this investment compared to the average.

It may also reflect the uncertainty that the estimated savings will actually be realized. The figures on costs, savings, and economic life are *estimates* of what will happen in the future. Often, a higher than average earnings rate is used when these uncertainties are believed to be great. (Uncertainty can also be allowed for by arbitrarily shortening the estimate of economic life. Care should be taken not to *over-allow* for uncertainty by using both a short life and a high earnings rate.)

Finally, the required earnings is sometimes adjusted to compensate for "administrative bother" that may be entailed in going into the venture—the unmeasured, but sometimes significant, cost of the additional management headaches and worry that may be a consequence of making the proposed investment.

Income Taxes

Under the profit maximization premise, an investment is made in order to increase the owners' equity. The increase in owners' equity is not as great as the cost savings or additional revenues that flow in from the investment, however, since a substantial fraction of these savings or revenues usually will be paid to the government in the form of additional income taxes. Owners' equity will be increased only by the amount remaining after these additional taxes have been deducted.

If "annual operating savings," as defined above, were the same as "additional profit subject to income tax," then profit after taxes could be found simply by multiplying the profit by the complement of the estimated future tax rate (i.e., 1 minus the tax rate). Thus, if 50 per cent is accepted as a reasonable estimate of future corporate tax rates, the profit after taxes would be one half the profit before taxes.

In estimating annual operating savings, however, depreciation was intentionally omitted from the calculations. Since depreciation is an allowable expense for tax purposes, "additional profit subject to income tax" will therefore not correspond to "annual operating savings" in any problem where depreciation is a significant factor. In effect, the depreciation on the equipment being purchased provides a "tax shield"; it shields the annual operating savings from the full impact of income taxes.

The additional income tax that will be paid under the proposed investment can be estimated by deducting the additional annual depreciation from the annual operating savings and multiplying the difference by the estimated tax rate. Assuming annual operating savings of

$200 and additional depreciation of $100 per year ($1,000 investment with a life of ten years), the calculation could be made as follows:

Annual operating savings before taxes	$200	$200
Less: Tax deductible depreciation on new machine	−100	
Increase in taxable income	$100	
Increase in income tax (50% of above)		−50
Net Operating Savings after Taxes		$150

This calculation shows that of the $200 annual operating savings before taxes, $50 must be paid out as additional income taxes, thus leaving $150 as the net operating savings after taxes.[3]

If the proposed machine is to replace a machine that has not been fully depreciated for tax purposes; then the "tax shield" is only the differential depreciation (i.e., the difference between depreciation on the old and on the new machines). The remaining book value of the present machine can be spread over the economic life of the *proposed* machine in order to make the present machine's annual depreciation charge roughly comparable, timewise, to that of the proposed machine.[4]

In many types of alternative choice problems, the question of income taxes may be omitted entirely since the alternative that produces the most profit *before* taxes will also produce the most profit *after* taxes. This is the case with pricing problems and many make-or-buy problems. In problems involving depreciable assets, however, there is unlikely to be a simple relationship between savings before taxes and savings after taxes, and the above calculation is necessary for these problems.

Interest

Interest actually paid (as distinguished from imputed interest) is an allowable expense for income tax purposes; therefore, if interest costs will be increased as a result of the investment, interest provides a tax shield similar to depreciation, and its impact can be estimated by the same method as that shown for depreciation, above. In many problems, the effect of interest on income taxes is properly ignored either on the grounds that the impact is not significant or on the grounds that it is not feasible to relate a specific borrowing to the specific proposition being considered.

Quite apart from the tax consideration, interest was completely omitted in figuring the annual operating savings as defined above. As a result, the rate of return that results from the calculations is a rate that includes interest. An alternative procedure would have been to include the interest on borrowed funds as one of the cost items; the resulting rate of return would then have been a *net* rate, over and above interest charges. Either approach can be used provided the difference between the results that are obtained is recognized.

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[3] The foregoing assumes that depreciation will be taken on a straight-line basis. An adjustment may be necessary if some other method of depreciation is used for tax purposes.

[4] This only provides rough comparability because it does not allow exactly for the differences in timing of the two depreciation charges.

II. SOME COMPLICATIONS

The approach described in Part I will yield the time-adjusted return on the investment provided the figures can be reduced to two items: (*a*) a net investment, made now; and (*b*) a uniform stream of annual savings. In many problems, it is not possible to so classify the various elements, and in these problems either approximations must be used or the time-adjusted return must be found by what is called the "financial method." The use of this method is often desirable when the savings vary from year to year, when funds are required in increments over the life of the investment rather than entirely at the beginning, or when there is expected to be a significant salvage value realized at the end of the investment.

The Financial Method

The financial method (also called the "investor's method" or the "discounted cash flow" method) will handle any of the complications listed above, but it requires more arithmetic than the method described in Part I.

In this method the time-adjusted return is found by trial and error; that is, various rates are tried until a rate is found that makes the present value of all the savings equal to the amount of the net investment. This is the true rate of return.

This method will be illustrated by application to a problem in which it is assumed that the net investment is $1,000 and that operating savings are estimated to be $300 per year for the first five years and only $100 per year for the sixth through the tenth year.

As a first trial, the present value of these savings will be computed at an earnings rate of 20 per cent. From Table C, we find that the present value of $1⁄12 per month for the next five years at 20 per cent is $3.256. Table C does not tell us directly the present value of an amount to be received from the sixth through the tenth year, but this can easily be found by subtraction. The amount for ten years is $4.564, and the amount for the first five of these years is $3.256; therefore, the amount for the sixth through the tenth years must be the difference between these figures, or $1.308. The present value of the assumed savings can be computed by use of these factors, as follows:

Time Period	Actual Savings	Factor at 20%	Present Value
Yrs., 1– 5	300/yr.	$3.256	$ 977
6–10	100/yr.	1.308	131
Total			1,108
Net investment			1,000
Difference			+108

When the present value exceeds the net investment, a higher earnings rate is used on the next trial; when the present value is less than the net investment, a lower rate is used.

In this case, therefore, a higher rate must be used, and 25 per cent is selected. Another trial is made, as follows:

Time Period	Actual Savings	Factor at 25%	Present Value
Yrs., 1– 5	300/yr.	$2.985	$ 896
6–10	100/yr.	0.978	98
Total			994
Net investment			1,000
Difference			− 6

This calculation gives a present value that is slightly less than the net investment, which indicates that the time-adjusted rate of return is slightly less than 25 per cent.

In a similar fashion, all the factors involved in an investment can be compared with all the factors involved on the savings side of the equation, with the difference in the timing of the money flows being recognized by the application of a trial discount rate. Eventually a rate will be found that makes the present value of the investment approximately equal to the present value of the savings. Usually, a satisfactory approximation to this rate can be found in two or three trials.

Annual Savings Not Uniform

In the example of the financial method worked out above, a method of handling situations where the savings were not expected to be equal each year was shown. There are many problems in which the stream of savings is not in fact uniform. For example, it is reasonable to expect that the annual maintenance cost of many types of machines will increase as the machine ages, which means that the savings will decrease year after year.

A simple way of recognizing these variations is to estimate an *average* of these costs over the life of the machine. In view of the difficulty of making a reliable estimate of the maintenance costs in each year, this simple solution may be as good as any. If the savings vary considerably from year to year, however, an attempt to estimate a single average figure often yields a result that is not sufficiently reliable because the influence of present values is usually excluded from the averaging process. For example, for a $1,000 ten-year investment with *uniform* savings of $200 a year, the time-adjusted return is, as calculated in Part I, 17 per cent; whereas if the savings are $300 for the first five years and $100 for the last five—an *average* of $200 per year—the time-adjusted return is, as shown in the above illustration of the financial method, almost 25 per cent.

Dr. George Terborgh of the Machinery and Allied Products Institute has worked out formulas that, among other things, contain a built-in allowance for certain changes in maintenance costs, and they are described in the second and third references at the end of the chapter.

Residual Value of the Proposed Machine

The approach suggested in Part I makes no allowance for a possible salvage or resale value of the proposed machine at the end of its useful life. In a great many cases, the estimated residual value is so small and occurs so far in the future that it has no significant effect on the decision. Moreover, any salvage value that is realized may be almost, or completely, offset by removal and dismantling costs.

In situations where residual value is significant, the *present value* of the net residual value (after removal costs) should be subtracted from the purchase price of the new machine as a part of the calculation of net investment. For example, if a net salvage value of $1,000 is estimated to be realizable ten years hence, and assuming a discount rate of 10 per cent, $386 (or, rounded, $400) would be subtracted. (Table A shows that the present value of $1 received ten years hence, at 10 per cent, is $0.386.) This method requires that a discount rate be assumed; often the required earnings rate is used. If such an assumption cannot reasonably be made, then the problem can be solved by the financial method.

Uneven Lives

The approach described in Part I assumes that the present machine can be used, physically, for a period of time at least as long as the *economic* life of the proposed machine. For many types of equipment, this assumption is reasonable. In situations in which the assumption is not valid, however, the operating savings will not in fact be earned each year of the period being considered, for a new machine must be purchased anyway when the physical life of the present machine ends, and savings should not be counted for any year thereafter.

If the expected physical life of the present machine is significantly shorter than the expected economic life of the new machine, some way must be found of making an equivalence between the time periods covered by the two alternatives (keep the old machine or buy the new machine). Of the several possible approaches to this problem, one that is often used is to limit the analysis to the time period that corresponds to the remaining physical life of the present machine. The fact that the proposed machine, if purchased, will have some value at the end of this time period is recognized by subtracting an estimate of the present value of this remaining value from the purchase price in order to determine the net investment applicable to the period being analyzed. The rate used for the present value computation should theoretically be the rate of return on the proposal, and this requires the use of the financial method described above. The use of an approximate discount rate (e.g., the minimum earnings rate required) often introduces no significant error, however.

As an example, assume that a proposed machine will cost $1,000, has an economic life of ten years, and that savings of $200 per year are expected if it is purchased. Assume further that the machine that is to be replaced has a remaining useful life of six years, and that the proposed machine has an estimated value of $300 six years hence. The present value of $300 six years hence at an estimated rate of 15 per cent is found from Table A to be $130; thus the net investment becomes $1,000 — $130, or $870; the Table C factor is 870 ÷ 200, or 4.35, and this factor indicates a time-adjusted return for six years of 12 per cent.

Value of the Present Machine

In calculating the net investment, it was suggested that the resale value, if any, of the present machine be subtracted from the installed cost of the proposed machine. This implicitly assumes that (*a*) if the proposed machine is not purchased, the present machine will continue to be used, and its resale value will decrease to zero through its continued use; and (*b*) if the proposed machine is purchased, the present machine will in fact be sold or converted to some other productive use. In other words, the net investment is assumed to represent the total amount of additional funds that must be committed to the operation. If either of these assumptions is not valid, and if the amount involved is significant, the resale value of the present machine should be treated separately (by, for example, the financial method) and not netted against the gross investment in the proposed machine.

The disposition of an existing asset may involve a write-off of undepreciated book values or a sale at a price above book value. In either of these cases, special tax considerations may apply since the write-off may give rise to a capital loss and the sale to a capital gain. In general, gains on the sale of equipment, real estate, and machinery used in a business are taxed at 25 per cent. Losses on such sales are offset against gains (thus in effect reducing taxes by 25 per cent) unless they exceed the gains; the regular income tax rate applies to the excess of losses over gains. Expert tax advice is needed on problems involving gains and losses on the sale of depreciable assets, for the line between the assets subject to this rule and other assets is difficult to define. In any event, when existing assets are disposed of, the relevant amount by which the net investment is reduced is the proceeds of the sale, adjusted for taxes.

Sales Volume

If the proposed machine increases the company's productive capacity, and if the increased output can be sold, the incremental profit on this increased volume can be counted as a "saving" arising from the proposed machine. Incremental profit is the difference between added sales revenue and incremental costs, which usually include direct material, direct labor, direct selling costs, and any other costs that would not have been incurred if the increased volume had not been manufactured and sold.

Several Alternatives

Some proposals involve a choice among several alternatives, each involving a different capital investment. In approaching these problems, it is often useful to start with the alternative that requires the smallest investment and to analyze the next most expensive alternative in terms of its *incremental* investment and its *incremental* savings above those of the least expense alternative. In other words, this question is asked: Is the *additional* investment in the second alternative justified by the *additional* savings that are expected from it, over and above the savings expected from the first alternative?

Investments Not Liquidated through Operations

When an investment is made in a new machine, it is expected that the funds so invested will be recouped, through savings or additional profits. Therefore, the savings or additional profits that will result from introduction of the machine must be large enough both to recover the investment itself and to return a satisfactory yield over and above the amount invested. The formulas described above are set up so as to take this into account.

There are many situations, however, where the amount of the investment is returned intact directly to the owner upon the termination of the proposition. If a savings bank pays you $20 per year on the $1,000 that you have deposited in it, your return is exactly 2 per cent. The formulas described above fit this situation only if account is taken of the present value of the funds that will be freed at the end of the proposition. The same concept applies to many problems involving an investment in inventories, receivables, or other assets which ultimately will be turned into cash.

SUMMARY

None of these complications should be permitted to obscure the essential nature of the problem, namely, that you are trying to find out whether the estimated savings are sufficiently attractive (i.e., yield a high enough return) to warrant committing funds to the proposed investment. Many proposals are so obviously attractive or so obviously unattractive that the decision can be made without any calculations at all. Some contain complexities that have not been touched on in this introductory discussion. A significant fraction of the proposals, however, do require a careful analysis of the type described in this chapter. Again, it should be pointed out that capital budgeting problems are one type of project planning problem, and the comments about those problems made in Chapter 17 are fully relevant here. In particular, the student is cautioned against overemphasizing the significance of the "figure solution" and neglecting the unmeasured factors, which is easy to do because of the apparent precision of the formulas and the work involved in making calculations.

SUGGESTIONS FOR FURTHER READING

GRANT, EUGENE L. *Principles of Engineering Economy.* New York: Ronald Press, 1950. This is a "classic" on the subject.

MAPI Replacement Manual. Machinery and Allied Products Institute, 1950.

TERBORGH, GEORGE. *Dynamic Equipment Policy.* New York: McGraw-Hill Book Co., Inc., 1949.

DEAN, JOEL. *Managerial Economics,* especially chap. 10. New York: Prentice-Hall, Inc., 1951.

CASES

CASE 18–1. RE-EQUIPMENT PROBLEMS

A. BUY OR LEASE

The Asher Company has decided to acquire two machine tools for two unrelated purposes, a vertical milling machine and a turret lathe. The milling machine can be purchased for $10,000, delivered and installed, or it can be leased for $1,900 per year. The turret lathe can be purchased for $10,000, delivered and installed, or it can be leased for an initial payment of $1,000 and a rent of $2,000 per year. In either case the lease runs for ten years and is noncancellable; rental payments are to be made in equal monthly installments. No repair or service work other than delivery and installation would be furnished by the manufacturer under the lease agreement. The Asher Company engineer estimates the economic life of both machines at ten years, and he estimates zero salvage value at the end of ten years. The company can borrow money at 5 per cent, although it would not plan to negotiate a loan specifically for the purchase of either of the machines.

Questions

1. Calculate, for each machine, the payback period, unadjusted return on investment, and time-adjusted return on investment that would result from purchasing rather than leasing the machine, disregarding income taxes and resale value of the machine. (Note: in buy-or-lease problems, the "investment" is the price of the purchased machine less initial payment on the leased machine, and "savings" are the rentals saved by not leasing.)

2. Assume that the Asher Company expects to earn 20 per cent on its investments. What action should the company take?

3. Discuss the relative degree of uncertainty that should be considered in judging the accuracy of each of the figures used in this problem.

B. MACHINE REPLACEMENT

The Parsons Company is considering the purchase of a vertical milling machine to replace an obsolete milling machine. The machine currently being used for the operation is in good working order and will last, physically, for at least twenty more years. However, the proposed machine will perform the operations so much more efficiently that Parsons Company engineers estimate that labor, material, and other direct costs of the operation will be reduced $1,900 a year if the proposed machine is installed. The proposed milling machine costs $10,000, delivered and installed. Its economic life is estimated to be ten years, with zero salvage value. The company can borrow money at 5 per cent. The company expects to earn 20 per cent on its investment. Taxes are to be disregarded.

Questions

1. Assuming that the milling machine now being used has zero book value (cost, $10,000; accumulated depreciation, $10,000) and zero net salvage value:
    - *a*) How does the numerical solution of the problem differ, if at all, from the solution of the milling machine problem described in Part A?
    - *b*) How does the relative margin of error that is likely to be present in each of the figures in this problem differ, if at all, from the margin of error in the figures for the milling machine problem in Part A?
2. Assuming that the present machine is being depreciated at a rate of 10 per cent, that it has a book value of $5,000 (cost, $8,000; accumulated depreciation, $3,000), and has zero net salvage value today, what action should be taken?
3. Assuming the present machine has a book value of $5,000 and a salvage value today of $3,000, and that if retained for ten more years its salvage value will be zero, what action should be taken?
4. Assume the new machine will save only $950 a year, but that its economic life is expected to be twenty years. If other conditions are as described in Part B (1), what action should be taken?

C. MACHINE REPLACEMENT FOLLOWING EARLIER REPLACEMENT

The Parsons Company decided to purchase the milling machine described in Part B. Two years later, an even better milling machine comes on the market and makes the other machine worthless. The new machine costs $20,000, delivered and installed, but it is expected to result in annual savings of $5,000 over the milling machine described in Part B. The economic life of this machine is estimated to be ten years. Taxes are to be disregarded.

Questions

1. What action should the company take?
2. If the company decides to purchase the new milling machine, a mistake has been made somewhere because a good machine, bought only two years previously, is being scrapped. How did this mistake come about?

D. EFFECT OF INCOME TAXES

Assume that the Parsons Company expects to pay income taxes of 50 per cent and that a loss on the sale of machinery is treated as an ordinary deduction, resulting in a tax saving of 50 per cent. The Parsons Company expects to earn 10 per cent on its investment after taxes.

Questions

1. What action should be taken in respect to the milling machine described in Part B (1)?
2. In respect to the milling machine described in Part B (2)?
3. In respect to the milling machine described in Part C?

CASE 18–2. STANDEEN MANUFACTURING COMPANY

The Standeen Manufacturing Company, which produced oil burners, had followed a policy of purchasing the metal cabinets required in the assembly of its burners. In 1939, however, the executives were considering whether the company should continue to purchase the metal cabinets or whether it should make them. The cost of the cabinets represented about 15 per cent of the total cost of the completed oil burners.

The cabinets were purchased from a single supplier, and this supplier had always made delivery on time. In the early spring the company contracted for a full year's requirement, ordinarily between 1,500 and 2,000 units. The Standeen Company did not pay for the cabinets until delivery, but it was financially committed for the number ordered.

The cabinet supplier made the cabinets during his off-peak season and held them until Standeen asked for them. Then the cabinets were crated and sent directly to the Standeen dealers for installation with the Standeen burner on the customer's premises. Standeen's peak production was in August, September, and October. As a result of this method of off-peak production and the large volume of business which the cabinet manufacturer obtained from Standeen and others, it had been possible for him to quote a price lower than that of any competitors that Standeen's purchasing agent had discovered.

Nevertheless, in the opinion of the management of the Standeen Manufacturing Company, the purchase arrangement had certain unsatisfactory aspects. For one thing, the supplier did not provide full inspection at the time of crating; occasionally all necessary parts were not included or the cabinets had defects such as scratches that had developed during storage in the supplier's warehouse. The supplier made good any defects, but in order to provide full inspection at the factory at the time of shipment, he estimated that he would have to charge $1 more for each cabinet.

Another difficulty arose from the method of mass production used by the cabinet supplier. Each cabinet was composed of several pieces, including side panels and top. In order to obtain low costs, the cabinet manufacturer made large lots of each individual piece. These pieces were painted and baked in lots, and often there was some slight variation in the color of different lots. Thus, when the individual pieces were assembled into a cabinet, it was possible that the side panels did not match the top.

One Standeen executive believed the present purchasing arrangements slowed up the adoption of new cabinet models. The company first had to submit the specifications to the cabinet manufacturer and have a model made. This model then had to be inspected by the Standeen company's sales department, a process which necessitated either shipping the model cabinet to the company or sending a Standeen representative to the supplier's plant. Additional negotiations were often necessary after the model had been inspected.

In the event that the Standeen Manufacturing Company did decide to manufacture its own cabinets, the executives expected that certain disadvantages of the present arrangement would be overcome. They were of the opinion that a better inspection job would be possible at a total cost not much more than now paid the supplier. They were not bothered by the fact that the general practice in the industry was to purchase finished cabinets. One executive argued that if Standeen withdrew its business, the supplier's costs would rise and so would the price at which Standeen's competitors bought cabinets.

If the company were to produce its own cabinets, certain steps would have to be taken. It would be necessary to clear space in the factory, and equipment would have to be purchased or made available for cutting, shaping, welding, and painting. Experienced men would have to be obtained and trained in the company's methods. Detailed production plans would have to be developed.

Investigation revealed that sufficient factory space could be made available for the needed equipment by means of plant rearrangement. This was true despite the fact that the company had recently started in the production of equipment used by the United States Army in its rearmament program. There was adequate capital to meet the anticipated financial requirements. The corporation was currently estimating its income tax expenses as 20 per cent of its net income before taxes. The manufacturing processes required for the cabinets were somewhat similar to those already familiar to the company's workers, and some of the needed equipment was already at hand. It was estimated that other needed skilled and semiskilled men could be obtained and trained within thirty days.

The experience of the company was that, if it purchased cabinets on the basis of annual contracts for 1,000 or more, it could obtain them at a price of $35 a unit. The company's accounting department made cost estimates for making cabinets on the basis of a volume of 1,000 units. Estimated costs for a unit were as follows:

Material	$17.30
Direct labor	11.25
Overhead, at 100 per cent of direct labor	11.25
	$39.80

The Standeen Manufacturing Company followed the practice throughout its operations of charging overhead at a standard rate of 100 per cent of direct labor; it was roughly estimated that half the overhead represented variable costs. Executives estimated that the company would have to spend $10,000 for the purchase of new equipment and for the rearrangement of the plant in order to make cabinet production possible. This new equipment would be subject to depreciation at a rate of 15 per cent a year.

Question

1. Should the Standeen Manufacturing Company manufacture its cabinets?

CASE 18–3. PHILLIPS LAUNDRY

In January, 1954, the Phillips Laundry installed a new shirt-pressing unit. The results obtained from operation of this unit were so satisfactory that early in 1955 Mr. Howard Phillips, president of the laundry, was considering the purchase of a second new shirt-pressing unit.

For the preceding several years Phillips' sales had amounted to roughly $130,000 each year. Mr. Phillips, owner of the laundry, thought that sales probably would not change much during 1955, but he hoped eventually to increase sales volume. The business was subject to slight seasonal fluctuations which necessitated employment of part-time labor during parts of the year.

The laundry had always operated profitably, although since 1945 the shirt-laundering section had done no better than break even. Inasmuch as shirts made up an important part of the laundry's business, Mr. Phillips was extremely anxious to make this operation profitable. He had considered the possibility of raising shirt-laundering prices to the customer but had rejected this alternative because of the intense competitive conditions which existed in the area.

In order to determine where costs might be reduced, Mr. Phillips in 1953 had made a careful analysis of the operations performed on shirts. He concluded that high costs in the pressing department were his principal problem. At that time the shirt-pressing department included three separate but similar pressing units, called here Units A, B, and C. Each unit consisted of four presses. In each of Units A and B, a cuff and collar press and a front press were operated by one girl, a back press and a sleeve press were operated by a second girl, and two other girls did touch-up ironing and the folding of the finished shirts. Each of these two pressing units had a capacity of ninety shirts per hour. Unit C had four basically similar presses, but it was operated only when there were more shirts to be pressed than the other two units could handle. Two girls employed on a part-time basis operated Unit C and turned out forty shirts per hour.

Both the full time and part-time employees were paid 95 cents an hour; social security taxes and fringe benefits increased this expense to almost exactly $1 per hour. The company did not have a piece-work incentive plan, but the girls were free to leave the plant when they finished a day's work. Full-time girls were guaranteed and paid for a forty-hour week. In practice, however, they averaged only 27.5 hours of actual work a week; they had one hour off for lunch and two fifteen-minute rest periods daily. The remaining five hours per week is accounted for by their practice of leaving early. Part-time help was employed to operate the third unit rather than work the full-time girls over 27.5 hours.

In order to reduce shirt-pressing costs, Mr. Phillips made a major change in the shirt-pressing department in January, 1954. At that time, he replaced Unit A with new Ajax pressing unit. The Ajax Model 70, only recently announced, represented the first major technological advance in shirt-pressing equipment in ten years.

Each of the old units had cost $1,200 when purchased, and installation charges for all three units had amounted to $300. They were eighteen years old, however, and had been fully depreciated on the laundry's books. With periodic replacement of parts and routine maintenance, they probably could have been kept in operating condition indefinitely, but Mr. Phillips thought that the new type presses had made them obsolete. The old presses had no resale value.

The new Ajax pressing unit consisted of only three presses. It occupied only about half the space of one of the old four-press units. Building depreciation, light, and other space costs allocated to each press unit were approximately $1,000 per year. Thus, it could be said that this saving in space was worth $500 per year.

On the Ajax pressing unit, one girl operated both a collar and cuff press and also a new type machine which pressed the bosom and body of the shirt in one operation. This girl was able to operate these two presses simultaneously because of automatic timers which made it unnecessary to watch one press while inserting or removing a shirt from another press. A second girl operated the sleeve press and did all the folding for the unit. The touch-up, hand-ironing operation was completely eliminated. Even without this touch-up operation, there was a marked improvement in the appearance of shirts turned out by the new Ajax unit as compared to those turned out on the old units. The capacity of the Ajax unit operated by two girls was seventy shirts per hour.

Under the revised setup, then, the shirt-pressing department consisted of: (*a*) the new Ajax unit, which was operated by two girls on a full-time basis and which had a capacity of seventy shirts per hour; (*b*) one old unit which was operated by four girls on a full-time basis and which had a capacity of ninety shirts per hour; and (*c*) a second old unit which was operated only when needed by two girls on a part-time basis, with a capacity, when operated in this manner, of forty shirts per hour. Mr. Phillips continued his policy of using Unit C on a part-time basis rather than have his employees work over 27.5 hours per week. Exhibit 1 shows the number of hours the presses of each unit were in operation in 1954, the number of shirts each unit pressed, and the number of hours for which the operators of each unit were paid.

Exhibit 1

PHILLIPS LAUNDRY

Selected Data from the Pressing Department of the Phillips Laundry for 1954

Unit	Capacity in Shirts/Hour	No. of Hours in Operation in 1954	No. of Shirts Pressed in 1954	No. of Hours for Which Each Operator Was Paid
A. Two-girl unit—full-time basis.....	70	1,375*	96,250	2,080
B. Four-girl unit—full-time basis.....	90	1,375*	123,750	2,080
C. Two-girl unit—part-time basis.....	40	900	36,000	1,350†

* There were 250 working days in 1954. The presses were actually in operation about 5.5 hours per day.
† Part-time help were paid for their lunch hour and rest periods.

The cost of the three new presses of the Ajax unit was $7,935 f.o.b. the factory. Freight to Boston was $455, and installation charges were $100. There was no disruption of work while the presses were being installed over a week end, but there was some slowdown while the girls became accustomed to the new methods and procedures used with the Ajax unit. The slowdown resulted in an increase in wages for the period of about $100. Power costs were increased by the cost of electricity for a five horsepower motor which powered the bosom and body press. The motor used one kilowatt of electricity per hour at a cost of 4½ cents per kilowatt hour. Also, it was estimated that costs of operating the boiler and air compressor used to produce steam would be increased about $5 per month.

Exhibit 2

PHILLIPS LAUNDRY

Balance Sheet, December 31, 1954

ASSETS	
Current Assets:	
Cash	$ 4,100
Accounts receivable	5,500
Prepaid expenses	2,700
Total	$ 12,300
Fixed Assets:	
Machinery and equipment (net)	60,400
Building (net)	45,800
Total Assets	$118,500
LIABILITIES	
Current Liabilities:	
Accounts payable	$ 3,200
Accrued expenses	1,100
Total	$ 4,300
Long-Term Liabilities:	
Mortgage loan	31,400
Total Liabilities	$ 35,700
Net Worth:	
Capital stock	40,000
Surplus	42,800
Total Liabilities and Net Worth	$118,500

During 1954 the new Ajax unit performed much as expected. Mr. Phillips was pleased with the results and therefore was led to consider a second change in February, 1955. At about that time, the manufacturer of Ajax machines brought out a new model, Model 85, which was equipped with an automatic folding table. The capacity of this unit, which was also operated by two girls, promised to be eighty-five shirts per hour. In the new setup, as Mr. Phillips conceived it, a Model 85 unit would replace Unit B, the pressing unit then being operated by four girls. The two Ajax units would then be operated on a full-time basis, 1,375 hours each per year, and the remaining old unit, Unit C, would be operated only when necessary by two girls on a part-time basis. This arrangement would give Mr. Phillips one Ajax unit with a potential capacity of eighty-five shirts per hour, one Ajax unit with a capacity of seventy shirts per hour, and one old unit with a capacity of forty shirts per hour when operated by two girls, or eighty shirts per hour when operated by four girls.

The Ajax Model 85 would cost $9,030 f.o.b. the factory; freight would be $525; and the installation cost would be $120. The bosom and body press of the second Ajax unit would have its own five-horsepower motor. Costs of operating the boiler and air compressor would be increased about $5 per month by use of the Ajax Model 85 in place of the old equipment in Unit B.

Exhibit 3

PHILLIPS LAUNDRY

Income Statement, Year Ending December 31, 1954

Net sales			$131,000
Laundry operating costs:			
Productive labor	$46,500		
Productive supplies	12,400		
Power	4,200		
Plant overhead	17,100		
Total Operating Costs		$80,200	
Collection and delivery		18,200	
Sales promotion		4,500	
Executive salaries		7,100	
Office and administrative		8,400	
Total Costs			118,400
Net profit before taxes			$ 12,600
Federal income tax (30%)			3,800
Net Profit after Taxes			$ 8,800

An income statement for 1954 and a year-end balance sheet with figures rounded to hundreds of dollars are shown in Exhibits 2 and 3.

Question

1. Should the Phillips Laundry buy an Ajax Model 85 for use in Unit B?

CASE 18–4. MARTINSON TIRE COMPANY

In 1938, officials of the Martinson Tire Company were considering the advisability of replacing 84-inch rolls used in the processing of various types of rubber stock with special mixing machines, which had been recently introduced by the Macy Manufacturing Company. The operation involved was that of breaking down and mixing tire stock, including the addition of special chemicals and materials. Up to this time the mixing was accomplished by feeding the rubber stock repeatedly through steel rolls, set like a clothes wringer, which heated the stock by friction and blended the material thoroughly. These same rolls were used to roll out sheets of rubber and fabric. It was now proposed to separate the mixing and sheeting operations with special machines for the mixing job. Capital funds for the proposed changes were available, currently invested in high-grade 3 per cent bonds.

The question of purchasing the new mixers arose in connection with the plant modernization program which the Martinson Tire Company had inaugurated in 1936. This program was proceeding slowly because changes were made and new machines purchased only after careful study. In the plant modernization program which the Martinson Tire Company was initiating, detailed reports as to estimated costs of operating with existing equipment and with new equipment were obtained by the management before funds were appropriated to a particular project. Accordingly the claims in support of the proposed Macy mixers were examined with care.

The proposed plan, based on no increase in production capacity, called for six Macy mixers installed side by side in a single row on an elevated platform to be erected for the purpose directly over a battery of six of the original 84-inch roll mills which were to be left in place for use in sheeting. The pounding room was on the floor above the mixers, which would permit maximum use of gravity handling.

The recording thermometers, timing equipment, and all other mixer controls were to be located in the compounding room above the machines, and the three operators of the mixers were to be stationed at that level. Each operator would tend two mixers. Six more men, making a total of nine, would manage the six sheeting mills on the main floor below the mixers. One supervisor would be needed. The standard rate for mill operators was $0.445 per hour, for mixer operators $0.50 per hour, and $0.55 per hour for the supervisor.

The normal schedule called for 24-hour operation for 6 days per week, or 300 days per year, the machines to be run continuously for the 144-hour period between the week-end shutdowns.

The mixing procedure would vary widely with the many different types of stock handled. Stock received from masticators would go in first in all cases and be allowed to soften thoroughly before other materials were added. The quantities of other materials and the exact time intervals for the addition of each were carefully specified for a wide variety of products. The automatic time indicators and temperature recorders should obviate all chance for variation among successive batches of the same product.

In contrast to the proposed plan were current operations: production of 106,000 pounds per 24-hour day from a battery of seventeen 84-inch roll mills which did both the mixing and sheeting. The operating crew consisted of 17 machine men and one supervisor; power requirements totaled 15,523 kw-hr a day, as compared with an estimated 14,500 kw-hr under the proposed plan. Power was purchased at the rate of $0.01 per kw-hr.

There were prospective reductions also in material handling and compounding costs if the new mixers were installed. A handling operation costing $0.13 per thousand pounds would be done away with entirely. Compounding costs, then running $0.06 per thousand pounds, were expected to be reduced by at least 25 per cent, largely because of the advantages of handling larger average batches. Repair and maintenance costs also would be lower, at least an annual saving of $400 over the then current annual charge of $2,500.

Also put forth in support of the proposed plan was the fact that under the new arrangement of machines there would be a substantial saving in floor space: 864 sq. ft. as against 2,448 sq. ft. A rate of $0.30 per sq. ft. per year was the standard charge for the plant in figuring fixed costs.

The investment involved in the six new machines was substantial, for the Macy mixers cost $17,360 apiece installed, and the cost of the necessary alterations was estimated at $10,000. The expected life of the mixers was set at thirteen years, the same as for the roll mills. The installed cost of the roll mills had been $7,200 when they were purchased in 1933. Depreciation charges on the 17 roll mills ($122,400 investment cost) then in use were carried at $9,415.38 per year. One skeptic of the worth of the new machines argued that 6 mixers and 6 roll mills (cost $157,360) would mean an annual depreciation charge of $12,104.61, an increase of almost 30 per cent.

This argument was supported by one man whose first reaction was one of shocked surprise: "Why we paid $122,000 for those roll mills only five years ago. They're carried on the books at over $75,000! We'll have eight more years of depreciation charges of almost nine and a half thousand dollars a year before they're paid for!"

The advocate of the modernization program countered by saying that the bill for the roll mills had long since been paid, and if a mistake had been made in the original purchase or in charging for depreciation and obsolescence that was no reason to make another. "And it will be a mistake not to get these Macy mixers. They'll save us money. A fair estimate of what they'll cost us will be more than met by savings. Why these machines will pay for themselves in a little over three years!"

Questions

1. What is your estimate of the time it would take for the mixers to pay for themselves out of earnings? What are the uncertain elements in the estimates?

2. If the Martinson Tire Company desires a return on its investment of 20 per cent before taxes, should the mixers be purchased?

CASE 18–5. KERROB COMPANY

In March, 1954, the Kerrob Company was considering a proposal to replace four hand-loaded transmission case milling machines with an automatic machine. The company operated a large machine shop that did machining work on a subcontract basis for local industries in the Detroit area. One of the contracts was to machine transmission cases for truck engines for the Maynard Automobile Company. The Kerrob Company had negotiated such a contract with the Maynard Automobile Company for each of the previous fourteen years (except for two war years). For the last few years, the contract had been for 60,000 transmission cases annually.

The unfinished cases were supplied by Maynard. With a hand-loaded machine, all of the faces could not be machined at the same time. Each machine required the constant attention of one skilled machine operator.

The machines used by Kerrob were only three years old. Each machine had an annual output of approximately 15,000 cases on a two-shift, five-day week basis; therefore, four machines had been purchased at a total cost of $147,500.

The useful life of a hand-loaded machine on a two-shift, five-day week basis was estimated to be fifteen years. Its salvage value at the end of its useful life was estimated to be $1,000. Depreciation of $28,500 had been built up for the four machines, representing three years' accumulation. The purchase of the machines had been financed by a 5 per cent bank loan, and $45,000 of this loan had not yet been repaid. It was estimated that the four machines could be sold in their present condition for a total of $60,000, net, after dismantling and removal costs. The book loss resulting from the sale would be a deductible expense for income tax purposes and would therefore result in a tax saving of 52 per cent of the loss.

The machine being considered in 1954 was a fully automatic transfer-type milling machine, equipped with four machining stations. Automatic transfer equipment on this machine moved the part progressively from one station to the next and indexed at each station, finishing a complete case with each cycle of the machine. One skilled machine operator was required to observe the functioning of the machine and make any necessary adjustments.

An automatic transfer-type machine with an annual output of 60,000 transmission cases on a two-shift basis would be specially built by a machine tool manufacturer, and it was estimated that such a machine would cost $170,000, delivered and installed. The useful life of this machine was estimated to be fifteen years. No reliable estimate of scrap value could be made; a rough estimate was that scrap value would approximate the removal costs.

Exhibit 1

KERROB COMPANY

Selected Financial Information

Condensed Income Statement, 1953

Net sales	$5,364,213
Less: All costs and expenses	4,138,647
Profit before taxes	$1,225,566
Provision for income taxes	622,715
Net Income	$ 602,851

Condensed Balance Sheet, December 31, 1953

Current assets	$3,051,349	Current liabilities	$ 930,327
Fixed assets (net)	4,239,210	4% mortgage bonds	500,000
Other assets	151,491	Capital stock	1,000,000
		Surplus	5,011,723
	$7,442,050		$7,442,050

Automatic transfer-type machines similar to the one being considered had first been offered for sale in 1953 at a price of approximately $195,000. It was expected that the price would continue to drop somewhat over the next several years.

The Kerrob Company's engineering department was asked to prepare a study for use by the executives of the company in deciding what action to take. The direct labor rate for milling machine operators was $2.50 an hour, including provision for social security taxes and fringe benefits which varied with the payroll. There would also be a saving in floor space. This saving would amount to $400 annually on the basis of the charge made in 1954 for each square foot of floor space used, although the factory layout was such that it would be difficult to use this freed space for some other purpose, and no other use was planned. Out-of-pocket savings of $5,000 per year for other costs items were estimated if the automatic machine was purchased.

The Kerrob Company planned to finance any new equipment purchase with a bank loan at a rate of 5 per cent. Some selected financial data for the company are shown in Exhibit 1. The company considered the picture given by these statistics to be normal and expected the same general pattern to prevail in the foreseeable future.

Question

1. What action, if any, would you recommend? Why?

CASE 18–6. WEYBURN WAX COMPANY

In early 1954 the treasurer and production manager of the Weyburn Wax Company were considering the advisability of changing the present method of filling and capping cans of paste wax, one of the company's several products. The paste wax was a quality wax that could be used to polish many types of flooring material. It was packaged in five standard sizes ranging from one-half to eight pounds.

Sales of the paste wax had been increasing in the postwar period (see Exhibit 1) and had amounted to $210,000 in 1953. The sales manager believed that sales would probably continue to increase in the future.

Exhibit 1

WEYBURN WAX COMPANY

Paste Wax Sales

Year	*Paste Wax Sales*
1947	$ 91,700
1948	89,500
1949	112,000
1950	129,000
1951	163,000
1952	197,000
1953	210,000

Present Method of Filling and Capping

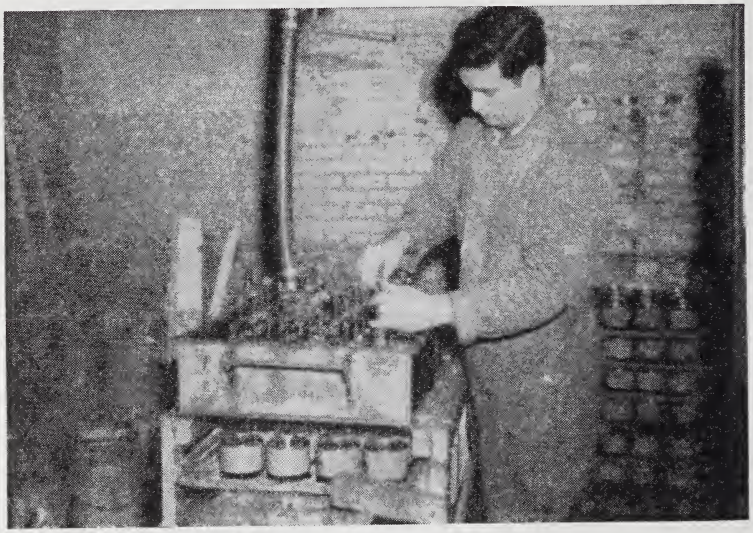
The mechanism currently used to fill the cans to the proper weight looked like a large cupcake baking tin (see Exhibit 2). For each size can there was a trough with several standard sized pockets in it. When wax was poured into the trough, these pockets filled up to their tops, and the excess wax was allowed to drain off. There was a hole in the bottom of each pocket, which was plugged by a stopper when wax was being poured in. Since all the stoppers were ganged together, all the pockets could be emptied at one time, each into a can which was placed beneath it.

The system operated in the following manner. When one-pound cans were to be filled, a trough containing thirty-two pockets, each exactly large enough to hold one pound of wax, was put into a frame. Thirty-two cans were placed under the trough on a tray so that there was a can directly under each pocket. Wax was poured into the trough until all thirty-two pockets were filled and all the excess wax had drained off. The stoppers were then removed from the bottom of the pockets, and each can was filled with the wax from the pocket above it. The tray of filled cans was placed on a hand conveyor and traveled a few feet into a storage area where the wax was allowed to harden. After the proper hardening time, the trays were conveyed to a capping machine in which the lids were pounded on.

Exhibit 2

WEYBURN WAX COMPANY

Present Method of Filling Paste Wax Cans



Based on several years' experience, the company had found that three men, working in a group, performed the filling and capping operations most efficiently. The procedure was for these three men to alternate between the filling operation and the capping operation; that is, they would work together filling and storing cans until enough cans of wax had hardened, and then they would switch to the capping operation. Each of these three men received $1.50 per hour. The company paid approximately 4 per cent of the payroll for social security and unemployment compensation taxes.

With the company's current production and sale of paste wax amounting to 368,400 pounds in 1953, the filling and capping operation was not a full-time job for the three men. The men, in fact, were taken off other jobs or temporarily employed for a couple of days when the filling and capping operations were to be performed. Because of the seasonal nature of the business, the work force at the Weyburn Wax Company was very fluid; that is, persons were frequently employed or laid off, depending on the volume of work. Workers were paid only for the hours they worked.

It was not the company's policy to manufacture an excessively large inventory of paste wax at any one time because the company did not wish to tie up a large amount of funds in inventory. The company had found, however, that it was most economical to produce at least enough wax in one production run to fill orders for a two- or three-week period because the workers involved took a few hours to reach an efficient work pace and because the company received quantity discounts on larger orders of raw materials which was purchased only as required.

The following operating data were available for 1953 regarding the number of cans of wax produced and the cans filled per minute by the three men working together:

(1) Can Size	(2) Annual Production Output (Number of Cans)	(3) Number of Minutes in 1953 Spent by Three Men Filling Cans	(4) Cans Filled per Minute by Three Men (Col. 2 ÷ Col. 3)
½ lb.	3,900 cans	280 minutes	14 cans
1 lb.	176,400 "	12,600 "	14 "
2 lbs.	17,600 "	2,500 "	7 "
4 lbs.	35,200 "	8,800 "	4 "
8 lbs.	1,750 "	440 "	4 "
Total	234,850 cans	24,620 minutes	

The average number of all cans filled per minute by three men was 234,850 cans ÷ 24,620 minutes = 9.54 cans per minute.

In 1953, the three men together capped an average of twenty cans per minute; cans could be capped at this rate regardless of their size.

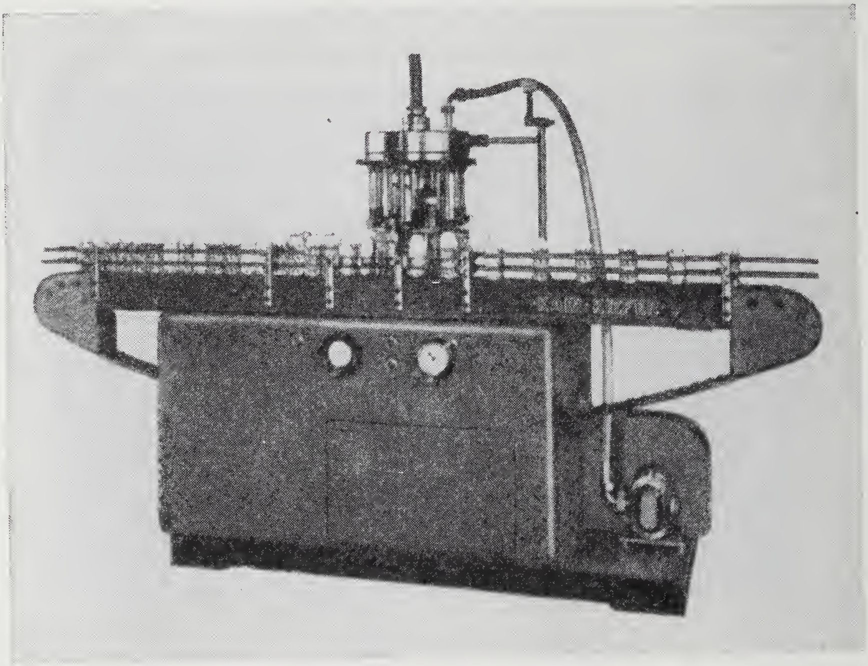
Proposed Automatic Filling Machine

As an alternative to replacing the present hand-filling equipment, the production manager was considering the purchase of the automatic-filling machine shown in Exhibit 3. The company could purchase this machine for about $5,300 delivered. This machine could be readily adjusted to fill any size can. It could fill 50 one-pound or half-pound cans per minute, and also could increase proportionately the production of other can sizes (i.e., 50/14 of the current output per minute). This machine could not be used for any other product made by the company.

Exhibit 3

WEYBURN WAX COMPANY

Automatic Filling Machine



The automatic-filling machine was expected to have a useful life of ten years. It was estimated that the maintenance cost on the machine for oil and adjustments would be $120 per year. Use of the machine would also add about $40 to the annual power bill of the plant. The present equipment had no scrap value, and one man would need eight hours to remove it and to prepare the area for the new machine. He would have to be paid $2 an hour. Since the new machine was a self-contained unit, the only other installation cost would be for electrical connections to be installed by an electrical contractor. This cost would amount to approximately $20.

The new machine would be operated by two skilled machine operators who would be transferred, as required, from other manufacturing departments. Such operators were currently being paid $2 per hour.

Under the proposed arrangement the capping operation would not be changed. Even though the number of cans filled per minute by the new machine would outstrip the number of cans capped per minute, the storage area was sufficient in size to store a large quantity of uncapped cans. It was the production manager's belief that if too large a bank of uncapped cans was built up, the filling operators could temporarily stop and go back to their other jobs while the men on the capping operation continued working. When the storage area was almost cleared of uncapped cans, the two filling machine operators could return and start filling additional cans until the storage area was again filled, or until the production run was completed.

General Considerations

One of the faults of the present system was the loss of wax because many cans were overfilled. Out of a batch of wax weighing 673 pounds in the first operation, about four pounds were lost due to overfilling at the filling and capping operation.[5] The automatic machine would practically eliminate this loss. The total manufacturing cost of paste wax up to the filling operation averaged $0.34 per pound in 1953; the average direct material cost per pound was $0.11; the average direct labor cost per pound was $0.04; and the manufacturing burden averaged $0.19 per pound.[6] The manufacturing burden was estimated to be roughly made up of $0.10 per pound variable costs and $0.09 per pound nonvariable costs.

Before presenting to the president of the company a proposal to authorize the purchase of one of the automatic machines, the production manager consulted with the company treasurer. The treasurer, after hearing how much the machines would cost, expressed concern as to whether the company could afford such a large cash outlay. The company was currently hard pressed for cash because of recent sizable capital expenditures. The treasurer stated that any further loans would be very difficult to obtain.

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[5] While the *record of cans filled* during 1953 showed that aproximately 368,400 pounds of paste wax had been produced, approximately an additional 2,200 pounds of paste wax had been manufactured during the period but had been lost due to overfilling.

[6] Average figures are used because the manufacturing process involves working with a batch of wax as a whole, and not with any single part of the batch such as a specific pound of wax. No specific unit of direct material or direct labor can be identified with a single pound of wax in the company's records. Instead, the *average* direct material and *average* direct labor costs are derived by dividing their respective total amounts for the period by the number of pounds of paste wax produced during the period.

The treasurer also mentioned the fact that if the automatic machine was purchased, it would require much less than a month of one-shift operation to fill all the cans of paste wax produced at the 1953 level of output. "As a result," the treasurer said, "we will have an idle machine on our hands for more than eleven months a year." Moreover, the treasurer thought capital expenditures should be deferred until the income tax situation was clarified. The company had paid income taxes at a 52 per cent rate in 1953. In 1954 the rate was scheduled to drop to 47 per cent; however, the treasurer believed that Congress would probably rescind this decrease. In 1955 and thereafter he thought the rate would go down somewhat.

Question

1. A couple of days after the meeting between the treasurer and the production manager, the treasurer gives you the information described in the case. He asks what action you would recommend.

CASE 18–7. WYMONT CHEMICAL COMPANY

In 1955 the Wymont Chemical Company brought in outside technical consultants to survey the processes used to manufacture the company's chemical products. Early in 1956 these consultants recommended that an immediate change be made in the process of manufacturing Teddol, an inexpensive chemical sold to industrial users.

Teddol was a chemical whose chief use was as a raw material in the manufacture of an item purchased by the Armed Services. Sales data for the preceding six years are shown in Exhibit 1. It was introduced in 1945, and sales remained small until the outbreak of the Korean war in 1950. In 1956, sales were running at about the 1955 level, and they were expected to remain at that level throughout 1956. Sales in 1957

Exhibit 1

WYMONT CHEMICAL COMPANY

Sales of Teddol, 1950–55

Year	Wymont Sales (Hundreds of Pounds)	Percentage of Industry Sales
1950	10,300	2.1
1951	50,020	7.0
1952	52,400	7.2
1953	45,100	6.7
1954	51,800	6.9
1955	56,500	8.0

and subsequent years would depend on the level of military requirements. Approximately ten chemical companies, including the Wymont Company, manufactured Teddol. Exhibit 2 shows cost data.

The consultants' proposal involved the installation of a new manufacturing process recently developed by the Montieth Company. One of the consultants had been involved in the development of the Montieth process and was enthusiastic about its prospects of opening an entirely new frontier in chemical production. One plant had already been installed on the Pacific Coast, and all reports were that it was working even better than had been expected. The chief advantage of the new equipment was the reduction in cost of manufacture because of great savings in materials cost (i.e., less waste) and the increased automatic nature of the process. The new process had no effect on the quality of the product.

Exhibit 2

WYMONT CHEMICAL COMPANY

Standard Cost Sheet for Teddol, 1955

	Cost per Hundred Pounds
Materials	$ 4.36
Direct labor*	2.80
Overhead:	
Department†	2.05
General	1.25
Total Factory Cost	$10.46
Average Selling Price, 1955	$12.48

* Includes supervisor.
† Includes waste of $0.85.

The consultants estimated that the building now given over to the manufacture of Teddol could be converted to the new process in about a two-month period of shutdown of the department. The cost of the new equipment, which would provide approximately 10 per cent more output per day, was estimated to be $180,000, and it was estimated that $25,000 additional would be spent in removing the old machinery and installing the new. For tax purposes, all this $25,000 would probably be capitalized and depreciated over the machine's useful life.

The old machinery had been built especially for making Teddol and probably had no value other than as scrap—$5,000 at the most. This machinery had been installed six years previously at a cost of $135,000. It was being depreciated on the company's books at a rate of $11,250 per year (i.e., 12-year life). If the new process were installed, there would therefore be a loss of $67,500 (less scrap recovery, if any) to be faced in the capital accounts of the company. The cost of the equipment had been completely written off as an expense for income tax purposes over the first five years of its life under a Certificate of Necessity.[7] The service life of the new equipment was estimated to be at least fifteen years, somewhat longer than the life of the old machine, largely because of the use of better materials at certain critical wearing points in the machinery.

The credit rating of the company was good, and funds to finance the project could be borrowed if needed at 5 per cent per year.

The Teddol department currently operated at its rated daily capacity 24 hours a day, five days a week, or approximately 250 days per year. It could be operated for a sixth day (Saturday) if the demand warranted, or it could be operated for three or four days per week. The equipment had to be shut down one day a week for normal maintenance. It was uneconomic to operate the equipment for less than 24 hours a day. The demand for Teddol was steady throughout the year, which was fortunate because the product could not be stored for more than a few days before deterioration.

At the present rate of operations the operating crew consisted of sixteen men (including a supervisor) on each shift. Labor costs, including fringe benefits such as unemployment insurance, for the crew of sixteen averaged $2 per hour (all shifts), which meant a weekly labor cost of $3,840. The proposed new process had the advantage of being a step toward complete mechanization of the operation, with the crew being reduced to eleven men including the supervisor. Because it was the lower-grade workers who would not be needed, the prospective average wage rate was estimated at $2.20 per hour, or a labor cost of $2,904 per week for five-day, three-shift operations.

One major disadvantage of the present process of making Teddol was the high wastage. In 1955 waste amounted to $0.85 per hundred pounds of finished product, a total of $48,000. The new process, it was claimed, had really made progress towards the solution of this problem. The saving on less waste under the new process was estimated by the consultants to amount to about $0.40 a hundred pounds of finished product.

There were expected to be some minor economies in power utilization, maintenance expenditures, and costs of materials handling that would amount to $2,000 annually. The consultants also pointed out that there would be about 20 per cent less floor space used, and this fact would affect the allocation of certain general overhead costs to the Teddol department. On the 1955 basis of allocation, this reduction would have amounted to $9,900.

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[7] A Certificate of Necessity authorizes a company to write off fixed assets, for tax purposes, over a five-year period, even though the expected useful life of the equipment is longer than five years. Such certificates are granted primarily for assets that are essential to production of military items or other assets related to the defense effort. A Certificate of Necessity would not be obtainable for the equipment or other costs of the Montieth process.

The company had adequate funds so that the project could be financed without borrowing. The management expected a return of at least 10 per cent after taxes on investments in facilities such as those used to manufacture Teddol. In 1956 the company was subject to an income tax rate of approximately 50 per cent.

Question

1. What action, if any, would you recommend? Why?

CASE 18–8. NATIONAL BRAKELINE DIVISION

In August, 1950, Mr. James Cornell, divisional sales manager of the National Brakeline Division of the Consolidated Metals Corporation, was approached by the Auto-Lease Sales Company with a proposal that Mr. Cornell lease automobiles for Brakeline Division salesmen who were located outside Detroit. The Brakeline Division sold automotive parts. The 1949 sales volume of the division was approximately $8,000,000; 95 per cent of this volume represented the sale of brake linings.

The headquarters of the Consolidated Metals Corporation were in New York City. Its sales volume, which in 1949 exceeded $91,000,000, was derived from a variety of products sold to railroads and other industries. Each of the ten divisions in the company operated relatively independently.

In addition to giving thought to leasing cars, Mr. Cornell was also considering purchasing company-owned cars to be used by his salesforce. At present, the division paid its salesmen seven cents a mile for the use of their own cars. The average mileage driven on company business was 20,500 miles per car per year.

Brakeline Division products were sold nationally by a salesforce of thirty-six men stationed in major cities throughout the country. The average salesman in the division earned $7,000 annually. Salesmen were paid a straight salary and had an expense account.

The Leasing Company's Proposal

The Auto-Lease Sales Company offered Mr. Cornell an arrangement whereby the Brakeline Division would pay $55 a month rental fee for each car it leased. The Brakeline Division would assume the public liability, property damage, and fire and theft insurance cost on the automobiles. The division would also purchase all the gasoline used. Whenever the lessee (Brakeline Division) found it necessary to have any one of the automobiles repaired and serviced, the repairs were to be made at the shop of an authorized dealer of the make of the automobile. The lessee was to pay for any repairs or damages to the automobiles resulting from an accident or collision.

Auto-Lease would provide the automobiles (1950 Ford or other similar vehicles) with standard equipment such as heater, windshield defrosters, spare tire, and spare tube. The term of the agreement was for one year. The agreement was to continue from year to year unless and until terminated by one of the parties.

The Auto-Lease company would pay for oil and for the cost of repairs and service. These were to include not more than four new tires and tubes, and not more than one oil change and lubrication for each 2,000 miles per car. "Repairs and service" excluded gasoline, storage, washing, and polishing. The leasing company was not responsible to the lessee for any loss of business or other damage caused by time lost in repairing or replacing the automobiles, or by the leasing company's failure to deliver the vehicles by reason of strikes or other causes beyond its control. The leasing company would provide the lessee another automobile in the event the lessee was unable to recover a stolen car or have one repaired within a reasonable time. If the lessee were deprived of the use of a car for more than seven days, no rental would be charged after the seventh day until an automobile was delivered to the lessee.

The terms of this proposal were as good as, or better than, those of any other Mr. Cornell had seen. The fee for each car was in no way dependent upon the number of cars to be leased by Mr. Cornell.

Mr. Cornell was also informed by the representatives of the leasing company that the Brakeline Division could keep some cars for two years at reduced cost. After studying other conditions surrounding such an arrangement, he dismissed this idea as not being suitable for the Brakeline Division. Mr. Cornell understood that the leasing agreement would not preclude the use of leased cars by persons in the immediate families of employees if these persons were qualified drivers.

Information from the New York Office

Mr. Cornell wrote to the New York office of Consolidated Metals Corporation for information about the experience of other divisions. Mr. Dudley, sales assistant to the president, provided average costs of operation of cars leased by the Eastern Wheel Division and estimates of costs of operating cars owned by the company based on the experience of the Eastern Wheel Division. These data are shown in Exhibits 1 and 2.

Exhibit 1

NATIONAL BRAKELINE DIVISION

Average Costs of Operation of Cars Leased by the Eastern Wheel Division*

	Cents per Mile	*Dollars per Year*
Gasoline	1.33	$ 309
Insurance (public liability, property damage, fire, and theft)	0.40	90
Accident repairs	0.20	45
Rental	3.05	708
Total	4.98	$1,152

* Based on 28 cars traveling at an average annual rate of 23,200 miles each.

Exhibit 2

NATIONAL BRAKELINE DIVISION

Estimated Costs of Operating Cars Owned by the Company*

	Cents per Mile	*Dollars per Year*
Gasoline	1.33	$309
Oil and lubrication	0.11	25
Repairs and maintenance	0.35	81
Tires and tubes	0.06	12
Licenses and fees	0.14	32
Insurance (public liability, property damage, fire, and theft)	0.40	90
Accident repairs	0.20	45
Depreciation	1.04	241
Interest on investment at 3½ per cent	0.18	42
Total	3.81	$877

* Assumes average mileage traveled to be 23,200 per year.

Mr. Dudley explained that depreciation in Exhibit 2 was based on insurance company records which he thought represented the consensus as to average first-year depreciation cost on cars in the low-price field. The figure thus estimated was 25 per cent, but since Mr. Dudley anticipated that automobiles could be purchased at a 10 per cent fleet discount, he estimated the actual net first-year depreciation at 15 per cent. This depreciation was figured on an average list price of $1,600 per automobile. Although his estimates in Exhibit 2 pertained to first-year operation of new cars, he thought that savings could be made by keeping company cars for two years or more, provided that the total mileage on the cars did not get so high that the cars would not be dependable or would be prohibitively expensive to maintain.

Purchasing Considerations

The purchasing department of the Brakeline Division informed Mr. Cornell that 1950 Fords, similar to the cars Auto-Lease could deliver, could be bought for an average delivered price of around $1,900. A fleet discount was not obtainable on any of the major makes of low-priced cars.

For tax purposes, rental payments could be deducted from income as an operating expense if the cars were leased; whereas depreciation and interest on financing could be deducted if the cars were owned. Mr. Fox, controller of the Brakeline Division, thought that company ownership of cars would tie up cash that would not be required under either a leasing plan or the present plan of salesmen's ownership. The cash required for the purchase of cars could either be obtained from funds which were available for investment in equipment, or it could be borrowed.

Salesmen-Owned Cars—the Present Arrangement

Mr. Cornell thought that if he decided to lease or purchase automobiles for his salesmen, some arrangement would have to be made to provide for their personal traveling. The Eastern Wheel Division required each man to keep an account of the miles he drove which were not on company business and to credit the company with that mileage at two cents per mile. On the basis of his conversations with the salesmen, Mr. Cornell made a rough estimate that each of them put about 3,000 miles a year on his car on nonbusiness trips, and he concluded that the salesmen would be willing to accept either of the two alternatives (i.e., leased or company-owned cars) provided they could use the cars for personal traveling.

Question

1. What action do you recommend?

Chapter

19

REVIEW CASES

CASE 19–1. C. F. CHURCH MANUFACTURING COMPANY

The C. F. Church Manufacturing Company was established in 1898 for the purpose of manufacturing toilet seats. The executives had devoted considerable effort to the development of a quality product, to widespread advertising of the product, and to the realization of economical manufacturing methods. As part of a program of control of manufacturing operations, a standard cost system and a plant budget were installed in 1938. In subsequent re-examinations of these systems, the president of the company and the cost supervisor expressed the belief that the new techniques had been of considerable assistance in arriving at selling prices and in controlling costs.

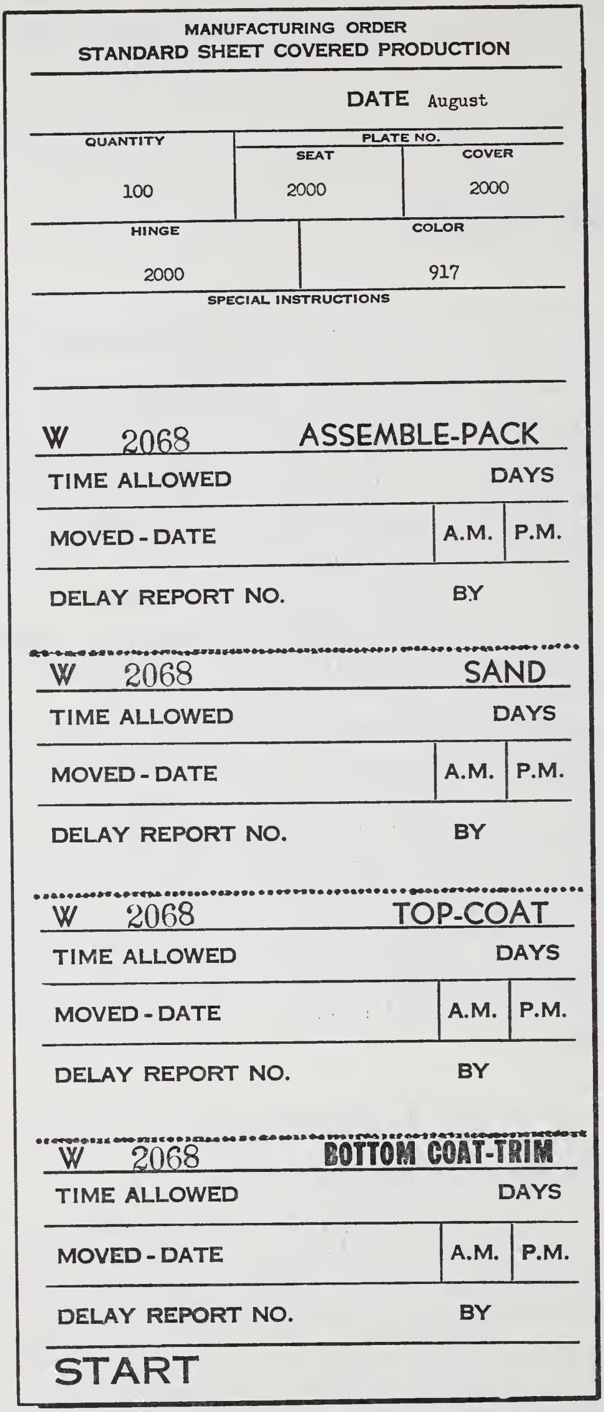
The manufacturing processes of this company were quite simple. First, the seats were shaped out of wood at a branch plant. They were then shipped to the main plant where they underwent the particular finishing processes required. Some units were sprayed with paint, but the best seats were coated with cellulose nitrate sheeting. After being coated, the rough edges were filed, and the seats were sanded, buffed, and polished. Finally, hinges and rubber bumpers were added, and the seats were packed for shipment. Most operations were performed by hand with the aid of small machines, such as paint spray guns and buffing wheels.

1. ACCOUNTING

Collection of Material and Labor Costs

A major part of the work required in the cost system was the orderly cumulation of data on actual and standard cost. The procedure in regard to materials used was as follows. When an order for a particular style of finish was started through the factory, the foreman of the department which performed the first operation received a manufacturing order (Exhibit 1). On the basis of the manufacturing order, the foreman

Exhibit 1



MANUFACTURING ORDER
STANDARD SHEET COVERED PRODUCTION

DATE August

QUANTITY	PLATE NO. SEAT	PLATE NO. COVER
100	2000	2000

HINGE	COLOR
2000	917

SPECIAL INSTRUCTIONS

W 2068 ASSEMBLE-PACK

TIME ALLOWED DAYS

MOVED - DATE A.M. P.M.

DELAY REPORT NO. BY

W 2068 SAND

TIME ALLOWED DAYS

MOVED - DATE A.M. P.M.

DELAY REPORT NO. BY

W 2068 TOP-COAT

TIME ALLOWED DAYS

MOVED - DATE A.M. P.M.

DELAY REPORT NO. BY

W 2068 **BOTTOM COAT-TRIM**

TIME ALLOWED DAYS

MOVED - DATE A.M. P.M.

DELAY REPORT NO. BY

START

Exhibit 2

C. F. CHURCH MANUFACTURING CO.

GEN 8

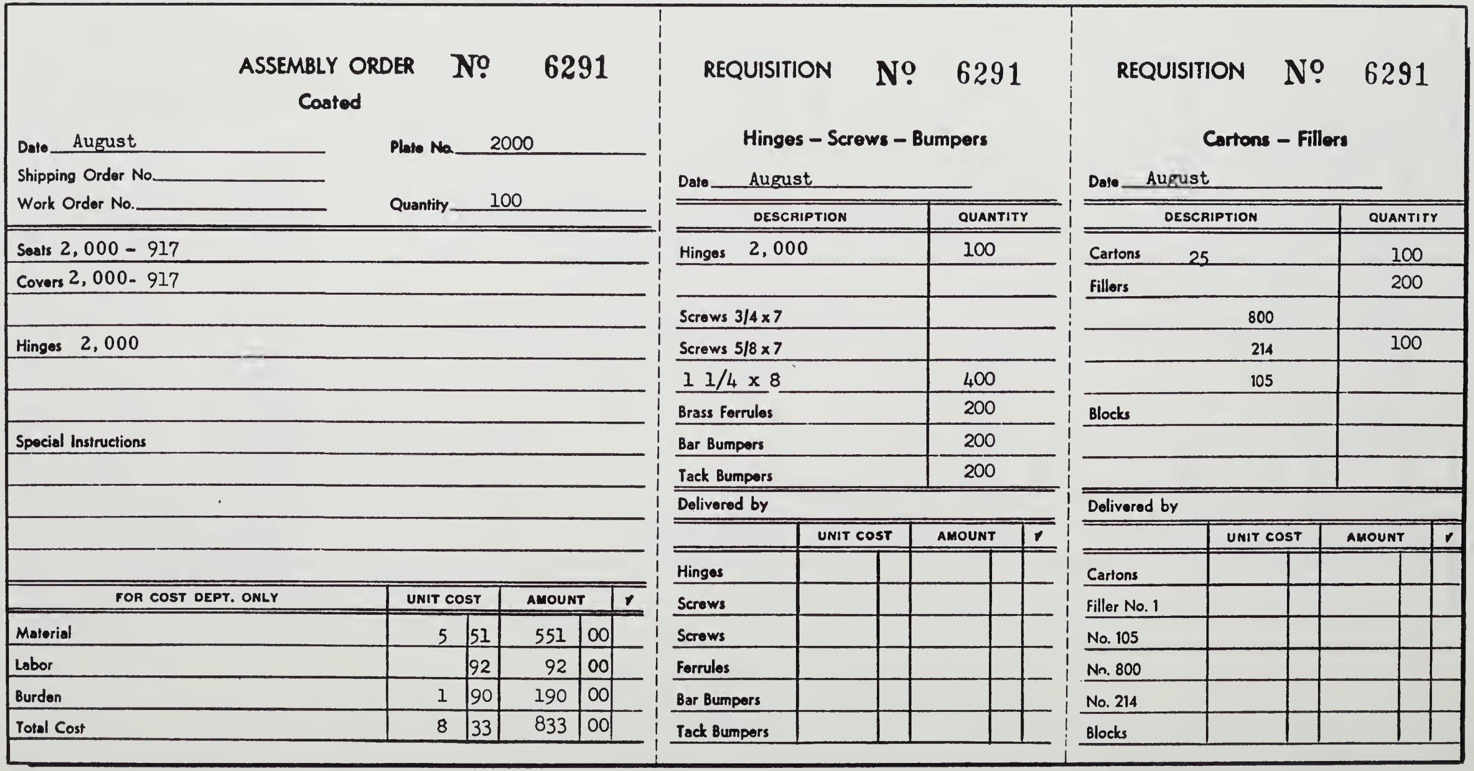
STORES REQUISITION Date August No. 2068

QUANTITY ORDERED	UNIT OR PART NUMBER	DESCRIPTION	UNIT COST	AMOUNT
100	580	Color 917		
100	520	" "		
100	570	" "		
100	51	" "		

CHARGE TO	ISSUED BY	APPROVED	DELIVERED BY
Work in Process			

Exhibit 3

C. F. CHURCH MANUFACTURING CO.



ASSEMBLY ORDER Nº 6291

Coated

Date August

Plate No. 2000

Shipping Order No.

Work Order No.

Quantity 100

Seats 2,000 - 917

Covers 2,000- 917

Hinges 2,000

Special Instructions

FOR COST DEPT. ONLY	UNIT COST		AMOUNT		✓
Material	5	51	551	00	
Labor		92	92	00	
Burden	1	90	190	00	
Total Cost	8	33	833	00	

REQUISITION Nº 6291

Hinges – Screws – Bumpers

Date August

DESCRIPTION	QUANTITY
Hinges 2,000	100
Screws 3/4 x 7	
Screws 5/8 x 7	
1 1/4 x 8	400
Brass Ferrules	200
Bar Bumpers	200
Tack Bumpers	200

Delivered by

	UNIT COST		AMOUNT		✓
Hinges					
Screws					
Screws					
Ferrules					
Bar Bumpers					
Tack Bumpers					

REQUISITION Nº 6291

Cartons – Fillers

Date August

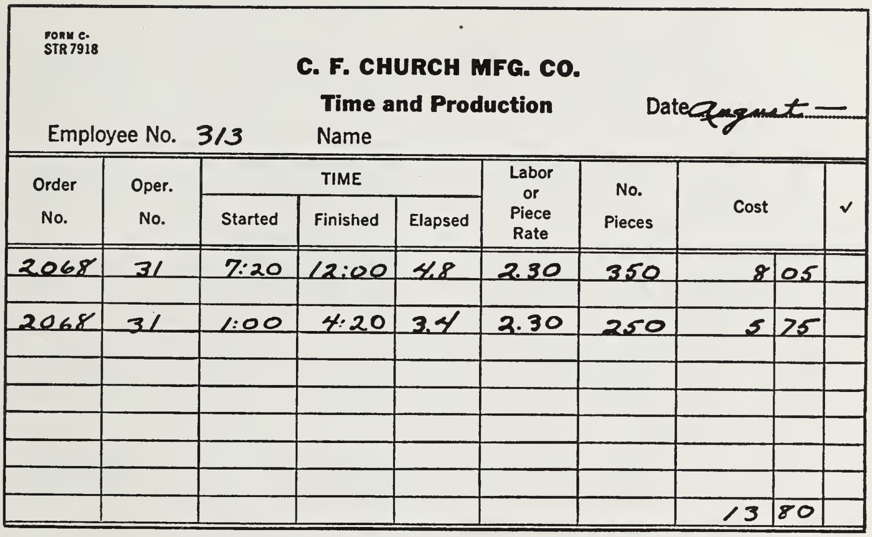
DESCRIPTION	QUANTITY
Cartons 25	100
Fillers	200
800	
214	100
105	
Blocks	

Delivered by

	UNIT COST		AMOUNT		✓
Cartons					
Filler No. 1					
No. 105					
No. 800					
No. 214					
Blocks					

filled out a stores requisition slip (Exhibit 2) for the materials necessary to manufacture this order. Items listed on this requisition subsequently were priced, and their purchase cost was entered on the requisition by the cost department on a last-in, first-out basis. (Inasmuch as raw material was purchased infrequently in large contract lots, this procedure was not difficult.) When seats were ready to be assembled and packed, the foreman in the assembly department made out an assembly order (Exhibit 3) which included a requisition for hinges, screws, bumpers, cartons, and fillers. These issues of materials were also costed at "last-in, first-out." The totals of the requisition slips for the month served as the basis for credits to the respective materials inventory accounts and a debit to the Work in Process account for the cost of material put into process.

Exhibit 4



FORM C-
STR7918

C. F. CHURCH MFG. CO.

Time and Production

Date August —

Employee No. 313

Name

Order No.	Oper. No.	TIME			Labor or Piece Rate	No. Pieces	Cost		✓
		Started	Finished	Elapsed					
2068	31	7:20	12:00	4.8	2.30	350	8	05	
2068	31	1:00	4:20	3.4	2.30	250	5	75	
							13	80	

The direct labor debit to Work in Process was equally straightforward. Daily, each productive employee made out a time and production report (Exhibit 4) on which he recorded the factory order number, the operation, the time spent on each operation, and the number of pieces which he had finished. A clerk in the payroll department entered the correct piece rate or hourly rate and made the proper extension. The total of the direct labor thus computed provided the credit to the Accrued Wages account and the debit (for direct labor) to Work in Process.

Exhibit 5

C. F. CHURCH MANUFACTURING CO.

Burden Development, Department No. 3

	100%	95%	90%	85%	80%	75%	70%	65%	60%	50%	40%
Indirect Labor:											
01 Supervision	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00	775.00
08 General labor	625.00	595.00	565.00	530.00	500.00	470.00	440.00	405.00	375.00	315.00	250.00
10 Idle and lost time											
11 Guaranteed rate cost	375.00	356.00	338.00	319.00	300.00	281.00	263.00	244.00	225.00	188.00	150.00
16 Overtime bonus	100.00	100.00	95.00	90.00	85.00	85.00	80.00	75.00	50.00	25.00	25.00
19 Repairs and maint.—M and E	175.00	175.00	165.00	165.00	160.00	160.00	160.00	150.00	150.00	100.00	100.00
Total Indirect Labor	2,050.00	2,001.00	1,938.00	1,879.00	1,820.00	1,771.00	1,718.00	1,649.00	1,575.00	1,403.00	1,300.00
Indirect Supplies:											
31 Repairs and maint.—M and E	25.00	25.00	25.00	20.00	20.00	20.00	20.00	20.00	15.00	15.00	10.00
35 Acetone and isotone	1,625.00	1,545.00	1,465.00	1,380.00	1,300.00	1,220.00	1,140.00	1,055.00	975.00	815.00	650.00
37 Sandpaper and sandbelts	11.00	10.00	10.00	9.00	9.00	8.00	8.00	7.00	7.00	5.00	4.00
38 Glue and cement	775.00	736.00	700.00	660.00	620.00	580.00	540.00	500.00	465.00	385.00	310.00
41 Consumable supplies	125.00	120.00	112.00	106.00	100.00	94.00	88.00	81.00	75.00	63.00	50.00
42 Loose and hand tools	50.00	48.00	45.00	43.00	40.00	38.00	35.00	33.00	30.00	25.00	20.00
46 Miscellaneous	15.00	14.00	14.00	13.00	12.00	11.00	10.00	9.00	9.00	7.00	6.00
Total Indirect Supplies	2,626.00	2,498.00	2,371.00	2,231.00	2,101.00	1,971.00	1,841.00	1,705.00	1,576.00	1,315.00	1,050.00
Fixed Charges:											
65 Insurance—bldgs. and equip.	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58	21.58
66 Insurance—L. and C.	161.00	152.00	145.00	137.00	128.70	121.00	113.00	105.00	97.00	80.00	64.00
68 Power	27.00	26.00	24.00	23.00	21.60	21.00	19.00	18.00	16.00	14.00	11.00
69 Water	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
70 Taxes—city and town	28.68	28.68	28.68	28.68	28.68	28.68	28.68	28.68	28.68	28.68	28.68

71 Taxes—social security	530.00	504.00	477.00	450.00	424.27	398.00	371.00	345.00	318.00	265.00	212.00
72 Depreciation	81.25	81.25	81.25	81.25	81.25	81.25	81.25	81.25	81.25	81.25	81.25
73 Provision for vacations	725.40	725.40	725.40	725.40	725.40	725.40	725.40	725.40	725.40	725.40	725.40
78 Group insurance	112.70	112.70	112.70	112.70	112.70	112.70	112.70	112.70	112.70	112.70	112.70
80 Pensions	420.36	420.36	420.36	420.36	420.36	420.36	420.36	420.36	420.36	420.36	420.36
Total Fixed Charges	2,125.22	2,089.22	2,053.22	2,017.22	1,981.79	1,947.22	1,910.22	1,875.22	1,838.22	1,766.22	1,694.22
Total Direct Expense	6,801.22	6,588.22	6,362.22	6,127.22	5,902.79	5,689.22	5,469.22	5,229.22	4,989.22	4,484.22	4,044.22
Charges from other depts.	9,435.37	9,333.33	9,240.12	9,140.56	9,032.28	8,945.27	8,826.90	8,751.83	8,630.42	8,440.11	8,235.38
Total Expense	16,236.59	15,921.55	15,602.34	15,267.78	14,935.07	14,634.49	14,296.12	13,981.05	13,619.64	12,924.33	12,279.60
Direct labor dollars	9,375.00	8,906.00	8,437.00	7,969.00	7,500.00	7,031.00	6,562.00	6,094.00	5,625.00	4,687.00	3,750.00
Burden rate	173%	179%	185%	191%	200%	208%	218%	229%	242%	276%	327%

Standard Burden Schedule (Annual)

The debit to Work in Process for manufacturing expense was based on annual estimates of the relation of burden expenses to direct labor costs for each department. These annual estimates were made so that for each department there was available a schedule of standard burden expenses at varying possible rates of capacity utilization. Exhibit 5 illustrates such a schedule for the coating department.

The process used to prepare the standard burden schedules was as follows:

1. Determine 100 per cent capacity of each department in terms of direct labor hours and direct labor dollars by theoretically loading each unit of productive machinery and equipment with the number of men required to operate it, together with the necessary productive employees on floor or bench work. Consider, however, the normal sales volume of different types of products and limitations as to type of equipment in any one department that affect the capacity of the plant as a whole. For example, output might be limited to the capacity of the coating and spraying departments.

2. Establish burden expense allowances for each department, considering four general classifications: indirect labor, indirect supplies, fixed charges, and charges from nonproductive departments.

3. Base allowance for indirect labor and indirect supplies on the past year's experience, making adjustments if necessary for changes in wage rates and the prices of supplies. Compute these projections first for the 100 per cent capacity determined above, and from this point use a sliding or graduated scale for the lower percentages of capacity. Give due recognition to the fact that some of these costs do not vary at all with production, that others vary in the same ratio as production, and that others, although variable, do not move proportionately with the rate of actual plant activity.

4. Prorate power expense according to the number of horsepower hours used and metered in the respective departments; water expense (after consideration is given to any special demands for water in particular departments such as steam) according to the number of employees; insurance, taxes, and depreciation with reference to the net book value of buildings and equipment. Charge directly to the department involved specific insurance which definitely can be allocated to an individual department, such as automobile insurance on trucks in the shipping department or boiler indemnity for the steam department.

5. Distribute the total expense of nonproductive departments such

as steam, general plant, shipping, and plant administration to the productive departments on the most logical basis: steam according to floor area, general plant and plant administration according to direct labor hours, and shipping according to direct labor dollars. The estimated cost of defective work for the whole plant was distributed to operating departments on the basis of the expected distribution of direct labor dollars. This item of expense was included in the total of "Charges from Other Departments" shown at the bottom of Exhibit 5.

6. Revise the standard burden schedules only for a general increase or decrease in wage rates or material costs or an important change in the manufacturing processes.

Standard Burden Rate

After the burden expense schedule was prepared, company executives estimated the percentage of capacity utilization expected during the coming year. The standard burden rate was the rate shown on Exhibit 5 for the estimated percentage of capacity. For example, it was estimated that during the year the coating department would operate at an average of 80 per cent of capacity. The standard burden rate for the coating department was therefore 200 per cent of direct labor, as shown at the bottom of the 80 per cent column in Exhibit 5. The other columns in Exhibit 5 were used for control purposes, as described subsequently.

Actual Burden Costs (Monthly)

Actual burden costs incurred during the month were charged to the account "Burden" in the General Ledger and to an appropriate detail account in a Burden Subsidiary Ledger. There was a detail account for each item listed on Exhibit 5 (supervision, general labor, etc.) in each department. Service department and other overhead costs were allocated to the producing departments. At the end of the month, the amount of "absorbed burden" was calculated by multiplying the burden rate for each department by the actual direct labor cost of the department for the month. In the coating department, for example, the actual direct labor for August was $5,915.60, and this multiplied by 200 per cent gave $11,831.20, the absorbed burden. (Note that the rate used was the burden rate determined annually, *not* the burden rate under the column in Exhibit 5 that relates to the actual volume of the current month.)

The absorbed burden for all departments was debited to Work in Process and credited to the Burden account. Any balance remaining in the Burden account was then closed to Loss and Gain. In August, for example, actual burden was $45,914.98, absorbed burden was $45,904.44, so $10.54 was debited to Loss and Gain.

Standard Product Costs

Deliveries from work in process to finished goods were recorded by completion in the factory of the assembly order (Exhibit 3). On the lower left corner of that form there was space for the cost department to fill in the standard cost per unit and the total amount of standard cost for the order, and the total of these standard costs entries for a month was credited to the Work in Process account and debited to Finished Goods Inventory.

Exhibit 6

C. F. CHURCH MANUFACTURING CO.

STANDARD COST

DATE August

PLATE NO. 2000

Description	Material	Labor	Burden	Total
Receive woodwork	1.17	0.004	0.008	1.182
Insp. and hand sand		0.012	0.024	1.218
Bottom coat	0.542	0.038	0.076	1.874
Trim T.B. and O.F. seats		0.011	0.022	1.907
Sand edges T.B.C.F. out		0.003	0.008	1.918
Sand edges T.B.C.F. in.		0.003	0.008	1.929
Inspect		0.012	0.024	1.965
Top coat	0.543	0.079	0.158	2.745
Shave		0.010	0.020	2.775
Sand edges—upright belt		0.005	0.014	2.794
Sand seats and covers		0.039	0.107	2.940
Inspect and file		0.015	0.030	2.985
Dope		0.004	0.008	2.997
Buff seats and covers		0.108	0.208	3.313
Inspect		0.012	0.024	3.349
Buff repairs		0.044	0.085	3.478
Trade-mark		0.007	0.014	3.499
Drilling		0.004	0.008	3.511
Total seat	2.255	0.410	0.846	3.511
Total cover No.	1.983	0.399	0.826	3.208
Total seat and cover	4.238	0.809	1.672	6.719
Assemble		0.032	0.064	6.815
Cleanup polish		0.033	0.066	6.914
Seal end of carton		0.006	0.012	6.932
Inspect and wrap		0.034	0.068	7.034
Seat, label, and pack		0.010	0.020	7.064
Bar bumpers	0.043			7.107
Tack bumpers	0.019			7.126
Screws 1¼-8	0.047			7.173
Hinge	1.04			8.213
Carton and filler 2—No. 1	0.125			8.338
Total Cost	5.512	0.924	1.902	8.338

The standard costs per unit mentioned in the previous paragraph were prepared for each product in the form illustrated in Exhibit 6. Because the lines on these standard cost sheets were arranged by successive operations, they showed the cumulative cost of a product at the completion of every operation as well as the final cost at which the product was delivered to finish goods inventory. For each operation and for the total cost there was a breakdown which showed separately the standard costs of materials, labor, and burden. The method of arriving at these costs is described below.

Standard materials costs consisted of a predetermined physical amount per unit priced at the expected purchase price for each classification of raw stock or of finished parts stock. Standard labor costs for the various piece-rate operations were simply the current piece rates; in the case of day-work operations, they were the quotients obtained by dividing the day-work rate by an estimated attainable average output. Standard burden costs were found by multiplying the departmental burden rate selected for the year by the standard labor cost for the operation concerned. For example, the standard cost sheet for a style calling for a coated finish might show for an operation in the coating department a standard labor charge of $0.079. As indicated above, operations in the coating department for the year were estimated to be at 80 per cent of capacity, which for the coating department meant a burden rate of 200 per cent of productive labor. Thus, the standard burden cost for the operation with a labor charge of $0.079 was set at 200 per cent of this amount, or $0.158.

These standard product costs were used to price deliveries into finished stock, to cost work in process inventory, and to transfer production between accounts. Once the standard costs were prepared, it was expected that they would remain constant except for alterations necessary to reflect a significant change in the manufacturing process, a change in wage rates or in the price of materials, or the selection of a new normal percentage of operating activity which determines the unit allowance for burden.

Variances

At the end of each month's accounting period, a physical inventory of raw materials, supplies, work in process, and finished goods was taken. For this inventory, raw materials and supplies were priced on the basis of last-in, first-out purchase cost, and work in process and finished goods were priced according to the standard cost sheets described above. The difference between the inventory thus determined and the book balance of each inventory account was closed into Cost of Goods Sold.

The most important of these differences was for work in process inventory.

A work in process statement (Exhibit 7) was prepared each month. This report showed the beginning inventory at standard cost plus actual

Exhibit 7

C. F. CHURCH MFG. COMPANY

Work in Process

Period Ending August

Order No. GENERAL

Detail	Amount						
Balance from Last Period				158	597	19	
DIRECT MATERIALS				76	338	21	
DIRECT LABOR							
1 Varnish							
2 Spray	2	990	25				
3 Coating	5	915	60				
4 Filing		998	83				
5 Sanding	1	637	53				
6 Buffing & Polishing	6	175	78				
8 Assembling and Packing	4	788	60				
Total Direct Labor				22	506	59	
BURDEN							
1 Varnish							
2 Spray	6	180	50				
3 Coating	11	831	20				
4 Filing	1	937	73				
5 Sanding	4	489	05				
6 Buffing & Polishing	11	888	76				
8 Assembling and Packing	9	577	20				
10 Shipping							
Total Burden				45	904	44	
TOTAL COST				303	346	43	
Less Deliveries at Cost				222	368	74	
BALANCE IN PROCESS				80	977	69	

DELIVERIES AT COST

Date		Amount			Date		Amount			Date		Amount			
8/31	Del.	220	876	63											
	Var.	1	259	07											
	Defect.		251	04											
	Net	222	386	74											

Exhibit 8

C. F. CHURCH MANUFACTURING CO.

Summary of Entries to Inventory Accounts for August

Raw Materials

(Several accounts according to nature of material)

$151,204 Balance	$76,318.21 Requisitions, priced at last-in, first-out cost (debit to Work in Process).
$343,640.19 Purchases at invoice cost (credit to Accounts Payable).	$138.32 Adjustment to physical inventory (Dr. or Cr.).
$1,101.67 Materials salvaged from returned goods (credit to Cost of Goods Sold).	

A physical inventory of all raw materials was taken each month and the difference between inventory and book balance written off to Cost of Goods Sold.

Work in Process

$158,597.19 Balance	$220,894.24 Deliveries to finished goods at standard costs (debit to Finished Goods).
$76,318.21 Direct materials from requisitions priced at last-in, first-out cost (credit to Raw Materials).	$251.04 Defective work, from defective work order (debit to Burden).
$22,506.59 Direct labor from payroll summary (credit to Accrued Wages).	$1,259.07 Adjustment to physical inventory (Dr. or Cr.).
$20.00 Materials purchased not usually carried in inventory (credit to Accounts Payable).	
$17.61 Transfers from finished goods for reworking or alteration, at standard cost (credit to Finished Goods).	
$45,904.44 Absorbed expense (earned burden) from burden summary sheet (credit to Burden).	

A physical inventory was taken of all work in process every month. This was priced and totaled according to standard costs at last operation performed; the difference between the inventory and balance in the Work in Process account, representing the cost variation, was written off to Cost of Goods Sold.

Finished Goods

$429,682.73 Balance	$400,954.09 Shipment at standard costs (debit to Cost of Goods Sold).
$220,894.24 Deliveries to finished goods at standard costs (credit to Work in Process).	$17.61 Transfers to work in process for reworking or alteration at standard cost (debit to Work in Process).

direct materials, actual labor, and actual absorbed burden added during the period in each department. From this total cost figure, there were subtracted the actual deliveries to finished goods as determined by costing, at standard cost, the deliveries indicated on the completed assembly orders. The resulting "Balance in Process" was the "book" value of work in process and was compared with the figure obtained by valuing, at standard, the results of the physical inventory. Any difference indicated by this comparison constituted the variance of actual cost from standard and was closed to Cost of Goods Sold. The physical inventory balance at standard constituted the debit to Work in Process at the beginning of the next month. If this Work in Process variance was large, its causes were investigated and action was taken accordingly.

A descriptive summary of the inventory accounts is given in Exhibit 8.

2. CONTROL OF BURDEN EXPENSES

Budgeted Burden Expenses

The Church company used the departmental burden schedules to set bogeys for the foremen and supervisors who were responsible for incurring expenses. A knowledge of the actual amount of direct labor for each productive department made it a simple matter to determine which column of figures to use as the bogey standard for evaluating the spending performance of each foreman. For example, the coating department (Exhibit 5) might be expected to operate, on the average, at 80 per cent of capacity, but in any one month the actual operations might vary considerably from this average. Thus, if direct labor dropped to $7,031, the foreman would be expected to spend only $580 for glue and cement rather than $620 allowable at the average operating level. For the nonproductive departments the column selected was the one which listed the expenses expected for the percentage of capacity nearest the average operating level of all productive departments.

Comparison of Actual and Budget

The departmental comparisons of the actual burden expenses, by accounts, with the appropriate budgeted allowance for that volume, are illustrated in the departmental budget sheet, Exhibit 9. The August budgeted expense figures for the coating department are based upon an output level of 65 per cent of capacity. This figure was arrived at by comparing the actual direct labor expense for the month, amounting to $5,915.60, to the closest corresponding direct labor expense of $6,094

Exhibit 9

C. F. CHURCH MFG. CO.
HOLYOKE
Analysis of Overhead Expenses
DEPARTMENT #3 Coating Month August

			1	2	3	
			Budget	Actual Expense	Over or Under Actual	
1		INDIRECT LABOR				1
2	01	Supervision	775 00	756 00	19 00	2
3	04	Truck Drivers & Helpers				3
4	06	Shipping				4
5	08	General Labor	405 00	171 22	233 78	5
6	09	Repair and Rework				6
7	10	Idle and Lost Time		1 77	(1 77)	7
8	11	Guaranteed Rate Cost	244 00	28 14	215 86	8
9	16	Overtime Bonus	75 00	32 98	42 02	9
10	19	Repairs & Maint. & Mchy. & Equip.	150 00	38 26	111 74	10
11	17	Vacations		46 00	(46 00)	11
12	21	Paid Holidays				12
13		Total	1649 00	1074 37	574 63	13
14		INDIRECT SUPPLIES				14
15	31	Repairs & Maint.--Mchy. & Equip.	20 00	360 18	(340 18)	15
16	33	Repairs & Maint. Trucks				16
17	35	Acetone & Isotone	1055 00	739 48	315 52	17
18	36	Buffing Compounds & Buffs				18
19	37	Sandpaper & Sandbelts	7 00	9 60	(2 60)	19
20	39	Labels, Tape, etc., Glue & Cement	500 00	734 71	(234 71)	20
21	40	Shipping Cartons				21
22	41	Consumable Supplies	81 00	55 54	25 46	22
23	42	Loose & Hand Tools	33 00	13 55	19 45	23
24	46	Miscellaneous	9 00	7 51	1 49	24
25		Total	1705 00	1920 57	(215 57)	25
26		OTHER OVERHEAD expenses:				26
27		Insurance, power, taxes, social				27
28		security, depreciation, group				28
29		insurance & pension	1875 22	1472 46	402 76	29
30						30
31		DEFECTIVE WORK	600 00	251 04	348 96	31
32						32
33		DIRECT LABOR	6094 00	5915 60	178 40	33
34						34
35						35
36						36
37						37
38						38
39						39
40						40

which is under the 65 per cent column shown on Exhibit 5. (Exhibit 9 is a standard form, and only those lines that are pertinent to the operations of the coating department are filled in on the example shown.)

Exhibit 9 also showed two items over which the foreman had no control. "Other Overhead Expenses" was the total amount of fixed charges allocated to the department on the basis of the percentage distributions described earlier. "Defective Work" was the total amount of defective work budgeted ($600) and actual ($251.04) for the *entire plant,* and it bore no relation to the work done in the coating department. The amount allocated to each department for defective work was not shown on Exhibit 9 because the basis of allocation was considered too arbitrary. The amounts for both "Other Overhead Expenses" and for "Defective Work" were shown in the "Analysis of Overhead Expenses" principally as a matter of information for the foreman. They were not considered as being controllable by the foreman.

Each month the accounting department prepared Exhibit 10, summarizing the actual, budgeted, and absorbed burden costs for each operating department. The amount shown as Actual Expense was obtained by adding the "Charges from Other Departments" ($8,362.13 for the coating department) to the other burden items shown in Exhibit 9 (excluding defective work). The Budgeted Expense was the total burden for each department as shown on the burden development sheets (Exhibit 5) at the applicable level of operations (65 per cent for the coating department in August).

The amount of "absorbed burden" was computed by applying the *annual* burden rate to the direct labor in each productive department as explained in the preceding section.

In the opinion of the management the entries in the column headed "Loss or Gain on Budget" could be considered a measure of the effectiveness of departmental supervision, whereas the amount of "Over or Under Absorbed" was influenced both by efficiency and by the volume of production.

The departmental overhead budget constituted the point of real control over expenditures. At the end of each month, the president met with the cost supervisor and the foremen to discuss spending. At these meetings the foremen were encouraged to discuss their performance as indicated by the budget report. When the system was first installed, the cost supervisor did most of the talking, but with increasing familiarity with the costs for which he was responsible, each foreman gradually became "cost conscious," and after a short time each foreman knew approximately what his monthly performance would be, even before he saw the budget comparison report.

The foreman in charge of the coating department was particularly interested in controlling the overhead costs under his jurisdiction. Every month he discussed the analysis of overhead expenses with the factory manager and the cost supervisor to evaluate with them the performance of his department. During the first week of September, he

Exhibit 10

C. F. CHURCH MANUFACTURING CO.

Burden Summary and Statistics

Plant—Holyoke | Period Ending—August 31

Dept. No.	Description	Direct Labor	Actual Expense	Budgeted Expense	Loss or Gain on Budget	Absorbed Expense	Over or Under Absorbed
1							
2	Spray	2,990.25	6,464.64	7,103.64	639.00	6,180.50	(284.14)
3	Coating	5,915.60	12,829.53	13,981.05	1,151.52	11,831.20	(998.33)
4	Filing	998.83	2,590.83	2,190.20	(400.63)	1,937.73	(653.10)
4–I							
4–C							
4–5							
5	Sanding	1,637.53	3,907.74	5,243.47	1,335.73	4,489.05	581.31
6	Buffing	6,175.78	11,275.76	10,750.25	(525.51)	11,888.76	613.00
7							
8	Assemble and pack	4,788.60	8,846.48	8,998.58	152.10	9,577.20	730.72
9							
10							
11							
12							
14							
15							
	Total Plant	22,506.59	45,914.98	48,267.19	2,352.21	45,904.44	(10.54)

Year to Date

Dept. No.	Description	Direct Labor	Actual Expense	Budgeted Expense	Loss or Gain on Budget	Absorbed Expense	Over or Under Absorbed
1							
2		22,071.46	44,718.50			45,643.78	925.28
3		50,512.16	104,611.39			101,024.32	(3,587.07)
4		9,077.03	21,509.51			17,618.52	(3,890.99)
4–I							
4–C							
4–5							
5		13,660.61	35,648.86			37,443.73	1,794.87
6		51,978.12	98,119.96			100,057.88	1,937.92
7							
8		30,878.48	62,125.19			61,756.96	(368.23)
9							
10							
11							
12							
14							
15							
	Total Plant	178,177.86	366,733.41			363,545.19	(3,188.22)

Exhibit 11

C. F. CHURCH MANUFACTURING COMPANY

Summary of Performance in the Coating Department

	April		May		June		August	
	Actual	(Over) or Under	Actual	(Over) or Under	Actual	(Over) or Under	Actual	(Over) or Under
Indirect Labor:								
01 Supervision	811	(36)	782	(7)	756	19	756	19
08 General labor	654	(124)	558	(28)	418	22	171	234
10 Idle and lost time	....	...	....	...	....	...	2	(2)
11 Guaranteed rate cost	313	6	154	165	50	213	28	216
16 Overtime bonus	63	27	45	45	37	43	33	42
19 Repairs and maint.—mchy. and equip.	89	76	30	135	35	125	38	112
17 Vacations	....	...	....	...	....	...	46	(46)
Total	1,930	(51)	1,569	310	1,296	422	1,074	575
Indirect Supplies:								
31 Repairs and maint.—mchy. and equip.	5	15	85	(65)	176	(156)	360	(340)
33 Repairs and maint.—trucks	....	...	....	...	....	...	....	...
35 Acetone and isotone	1,300	80	1,134	246	1,031	109	739	316
36 Buffing compounds and buffs	....	...	....	...	....	...	....	...
37 Sandpaper and sandbelts	10	(1)	14	(5)	5	3	10	(3)
39 Labels, tape, etc., glue and cement	575	85	462	199	182	358	735	(235)
40 Shipping cartons	....	...	....	...	....	...	....	...
41 Consumable supplies	66	40	116	(10)	48	40	56	25
42 Loose and hand tools	37	6	14	29	10	25	14	19
46 Miscellaneous	27	(14)	9	3	9	1	8	1
Total	2,020	211	1,834	397	1,461	380	1,922	(217)
Other Overhead Expenses: Insurance, power, taxes, social security, depreciation, group insurance, and pension	1,456	561	2,014	3	1,836	74	1,472	403
Defective work	391	209	656	(56)	594	6	251	349
Direct labor	7,812	157	8,024	(55)	6,599	(36)	5,916	178

received the analysis of overhead expenses for August (Exhibit 9), and he checked all the items carefully to learn if there were any costs out of line with his expectations for that month. He copied the August figures onto a sheet (Exhibit 11) on which he had previously summarized the figures for recent months (except for July, which included a vacation shutdown). After he felt that he had a good idea of his cost position, he arranged for a meeting with the factory manager and the cost supervisor to review the situation with them.

Questions

1. What are the major purposes of the standards developed by the company?

2. How does the company develop standard burden rates? How often do *you* think they should be changed?

3. What steps are involved in the development of the standard cost sheet (Exhibit 6)? How accurate do you judge the figures to be?

4. What are the possible causes of the $1,259.07 credit to Work in Process labeled "adjustment to physical inventory" in Exhibit 8?

5. Explain so as to distinguish them clearly from one another the figures $12,829.53, $13,981.05, and $11,831.20 shown for the coating department on Exhibit 10.

6. If you were the cost supervisor, what evaluation would you make of the performance of the forman in the coating department in controlling his overhead costs? About which items in Exhibits 9–11 would you be likely to question him?

7. In the coating department for the month of August, what is the variance attributable to "Charges from Other Departments"? Of what significance is this variance to: (*a*) the coating department, and (*b*) the service departments which create these charges? Should this variance be included in the burden summary and statistics report?

CASE 19–2. CLIMAX SHIPPING COMPANY

In the spring of 1950, the controller of the Climax Shipping Company located in Pittsburgh was preparing a report for the executive committee regarding the feasibility of repairing one of the company's steam river boats or of replacing the steamboat with a new diesel-powered boat.

The Climax Shipping Company was engaged mainly in the transportation of coal from the nearby mines to the steel mills, public utilities, and other industries in the Pittsburgh area. The company's several steamboats also, on occasion, carried cargoes to places as far away as New Orleans. The boats owned by the Climax Company were all steam powered. All were at least ten years old, and the majority were between fifteen and thirty years old.

The steamboat the controller was concerned about, the Cynthia, was twenty-three years old and required immediate rehabilitation or replacement. It was estimated that the Cynthia had a useful life of another twenty years providing that adequate repairs and maintenance were made. While the book value of the Cynthia was $39,500, it was believed that she would bring somewhat less than this amount, possibly around $25,000, if she were sold in 1950. The total of immediate rehabilitation costs for the Cynthia was estimated to be $115,000. Of this amount $55,000 was for general overhaul, reconversion, and repairs, exclusive of work on the hull. It was estimated that these general rehabilitation expenditures would extend the useful life of the Cynthia, excluding the hull, for a period of about twenty years. The remaining $60,000 was for a new hull which would last approximately ten years. At the end of this ten-year period another new hull costing $60,000 at current costs would be required.

Spare parts from another boat which had been retired in 1948 were available for use in the rehabilitation of the Cynthia. These spare parts were new. An estimate of the fair value of these parts if used on the Cynthia placed their worth at $43,500. These spare parts would, in effect, decrease by $7,500 the expenditure of $60,000 required for the Cynthia's hull replacement and decrease by $36,000 the expenditure of $55,000 required for her general overhaul, reconversion, and repairs. It was believed, however, that if these parts were sold on the market they would bring around $30,000. These parts could not be used on any of the other Climax steamboats.

At the end of the useful life of the Cynthia, it was estimated that the cost of dismantling and scrapping the boat would be offset by the value of the scrap and used parts taken off the boat.

The controller was also concerned at this time with a city smoke ordinance signed in 1948 to take effect in 1952 which applied to hand-fired steamboats. To comply with the regulations of the ordinance, all steamboats had to be converted from hand firing to stoker firing. Several of the Climax Company's steamboats were already stoker fired; the Cynthia, however, was hand fired. The additional cost of converting the Cynthia to stoker firing, providing it was done at the same time as the general rehabilitation, was estimated to be $40,000. This $40,000 included the cost of stokers and extra hull conversion and was not included in the $115,000 rehabilitation figure. The controller was not too certain at this time just when stoker-firing of the Cynthia would become necessary since some local industries owning steamboats had already been granted relief from the ordinance for a period of several years beyond the effective date initially established. The controller also knew that if $115,000 were spent presently in rehabilitating the Cynthia and it was found out later that no relief or only temporary one- or two-year relief was to be granted under the smoke ordinance applying to hand-fired steamboats, the cost of converting to stoker firing would no longer be $40,000 but would amount to around $70,000. The higher cost of converting to stoker firing would be due to the additional tearing down and rebuilding which would not be necessary if the Cynthia were converted to stoker firing at the time of her general rehabilitation.

Currently, the annual operating costs for the twenty-man crew on board the Cynthia amounted to around $110,200 for wages, $1,880 for vacation and sickness benefits, $2,400 for social security payments, $1,800 for life insurance, and $15,420 for commissary supplies, a total of $131,700. If the Cynthia were converted to a stoker-fired boat, two less crew members would be necessary. It was estimated that the annual operating costs for an eighteen-man crew would amount to around $100,650 for wages, $1,650 for vacation and sickness benefits, $2,200 for social security payments, $1,620 for life insurance, and $13,880 for commissary supplies, a total of $120,000.

The other annual operating costs of the Cynthia, whether it had an eighteen- or twenty-man crew, were approximately $71,450, consisting of: repairs and maintenance, $24,400; fuel, $34,500; lubricants, $550; and miscellaneous service and supplies, $12,000.

As an alternative to rehabilitating the steamboat, the controller had contacted the Quapelle Company, a local boat manufacturer, to find the cost of replacing the steamboat with a new diesel-powered boat. The Quapelle Company quoted $325,000 for a diesel boat. In addition to this amount another $75,000 for a basic spare parts inventory would be necessary to service a diesel boat. A basic spare parts inventory worth $75,000 would be sufficient to service up to three diesel boats; however, if four or more diesels were purchased, it was estimated that additional spare parts inventory would be necessary. The length of life and the cost of replacing a diesel boat hull was estimated to be the same as for a steamboat; that is, an expenditure of $60,000 for a new hull would be necessary about every ten years. The useful life of a diesel-powered boat was estimated to be twenty-five years, at the end of which time the boat would be scrapped or completely rehabilitated at a cost approximately that of a new boat. The possibility of major diesel engine overhaul during the twenty-five-year life was not contemplated by the controller since information from other companies having limited experience with diesel-powered river boats did not indicate that such costs needed to be anticipated.

One of the features the Quapelle Company pointed out was the 12 per cent increase in average speed of diesel-powered boats over the steamboats. The controller of the Climax Company discounted this feature, however, because the short runs and lock-to-lock operations involved in local river shipping would prohibit the diesel boats from taking advantage of their greater speed since there was little opportunity for passing and they would have to wait in turn at each lock for the slower steamboats. In 1950 only two diesel boats, out of about forty boats, were operating on the river. The controller felt it would be many years, if at all, before diesel boats displaced the slower steamboats and thus before any advantage could be taken of the decreased shipping time per run.

After consulting the Quapelle Company and other companies operating diesel-powered boats, the controller of the Climax Company estimated that the annual operating cost of diesel-powered boats would total $156,640, broken down as follows: wages, for the thirteen-man crew, $77,300; vacation and sickness benefits, $1,320; social security payments, $1,680; life insurance, $1,170; repairs and maintenance (excluding possible major overhaul of diesel engines), $21,700; extra stern repairs, $2,000; fuel, $28,800; miscellaneous service and supplies, $12,650; and commissary supplies, $10,020.

All operating data the controller had collected pertaining to crew expenses were based on the regular two-shift, twelve-hour working day which was standard on local river boats. The controller had been informed, however, that the union representing crew members desired a change to a three-shift eight-hour day. If the union insisted on an eight-hour day, accommodations on board the steamers or the diesels would have to be enlarged. The controller was perturbed by this fact because he knew the diesels could readily be converted to accommodate three crews whereas steamers could not. How serious the union was in considering the change, when it would be put into effect if ever, and how strongly the union would insist on the change, were questions for which the controller could get no satisfactory answers. The controller felt that the union might have a difficult time in getting acceptance of its demands for three eight-hour shifts on steamers since it would be very difficult, if not impossible, to convert the steamers to hold a larger crew because of space limitations. The controller thought that the union might succeed in getting its demands accepted in the case of diesel-powered boats. One of the diesel boats presently operating in the Pittsburgh area had accommodations for three crews, although it was still operating on a two-shift basis. The diesel boats which the Quapelle

Company offered to build for Climax could be fitted to accommodate three crews at no additional cost.

Another factor the controller was considering at this time was alternative uses of funds. The Climax Shipping Company presently had sufficient funds to buy as many as three or four diesel-powered boats; however, there were alternative uses for these funds. Some of the other projects which the Climax Company was considering at this time had an estimated return of at least 10 per cent after taxes. The income tax rate at the time was 48 per cent.

Question

1. What action do you recommend?

CASE 19–3. HELVIN BLANKET COMPANY

The Helvin Blanket Company was a large producer of cotton blankets. Since the company performed all the operations from the baled cotton to the finished blankets, and since a market existed for cotton in various stages of manufacture, an ever-present problem before its management was at what point in the manufacture of a blanket the alternative of selling the uncompleted product was more profitable than continuing with the manufacturing process toward a later market. In the spring of 1956, during a period of undercapacity operations, an incident occurred which raised the question of the validity of using the familiar total average cost accumulations and prorations of the accounting department as a basis for deciding at which point to terminate manufacturing and to sell the product in process.

At a meeting of the principal executives in the spring of 1956, the sales manager proposed that the carding and spinning capacity of the mill be used to produce warp yarn which, he said, could be sold currently at a profit. The production manager, on the other hand, contended that the loom capacity of the plant rendered it desirable to continue any yarn operations through to the stage of blankets. The sales manager defended his position with the following figures which the cost office prepared for him on the basis of current standard costs:

	Cost per Pound, Warp Yarn	*Cost per Blanket*
Labor	$0.1316	$0.2937
Overhead	0.1054	0.2327
Processing materials	0.0083	0.0521
Raw materials	0.3812	1.1436
Cost (at standard)	$0.6265	$1.7221
Current selling price	0.6450	1.7000
Profit or (Loss)	$0.0185 per lb.	($0.0221) per blanket

Each blanket contained one pound of warp yarn and two pounds of filling yarn. The figures for "cost per blanket" were cumulative. Thus, the $0.2937 labor item under cost per blanket included the $0.1316 labor cost of making one pound of warp yarn, plus the labor cost of making two pounds of filling yarn and the labor cost of weaving the blanket.

The production manager challenged the validity of any figures which indicated that the optimum move for the management was to shut down the greater part of the mill in the face of a reasonably favorable market demand for blankets. He argued that the plant was set up to manufacture blankets, not yarn, and to sell yarn was, in effect, to get out of the blanket business in which the company had made its name. Moreover, he wasn't sure but that the company, despite the generally weak market, might do better financially by keeping the blanket room open.

The head of the cost office stated that the figures presented by the sales manager had been the result of painstaking studies of labor and material costs and of methods of distributing overhead to products. He admitted that certain allocations were rough and that different kinds of costs were reported together. On being questioned, he said that for both yarn and blankets about 15 per cent of the labor cost was "fixed" and that about 60 per cent of overhead was "fixed."

The executives had to reach a decision on the issue. The sales manager was opposed to selling blankets at a loss when he could be selling yarn at a profit. The production manager certainly didn't want to close down his blanket mill.

Questions

1. What different courses of action might be taken, and what arguments might be made to support them?
2. What information or forecasts might be necessary to round out the story?
3. On balance and in the light of the probable state of affairs, what would you decide?
4. If the current selling price of warp yarn was $0.725 per pound, instead of $0.645 as given in the case, would your decision be changed?

CASE 19–4. MARTALL BLANKET COMPANY

In the spring of 1941, the Martall Blanket Company was negotiating a large contract for blankets with the U.S. Navy. A question arose as to the method that should be used in estimating the price that the company would ask for these blankets.

In January, 1941, the production manager prepared an estimate of production for the 1941–42 season. This estimate, shown in Exhibit 1, was made on the assumption that the mill would be operated at three-shift capacity. There was general agreement in the company that demand was strong enough to warrant capacity operations for the foreseeable future. Production facilities could be used to make any of the blankets shown on Exhibit 1 interchangeably.

Exhibit 1

MARTALL BLANKET COMPANY

Production Estimate 1941–42

Style	*Size*	*Quantity*
Ashmont	72 × 90	12,000
Velona	72 × 90	26,000
Fairfax	72 × 90	22,000
Total Domestic		60,000
Army	66 × 84	75,000
Navy	66 × 90	25,000
Total		160,000

The production estimate was sent to the cost department which prepared cost and selling price estimates for each blanket appearing thereon. Raw material prices were obtained by averaging the prices of wool on hand and the prices of expected purchases for the period of the budget. Standard costs for labor, factory expense, and processing materials were added to raw material costs so as to arrive at a total manufacturing cost per blanket. These standard costs had been estimated in 1938 but were corrected subsequently for actual cost experience through ratios applied to labor, factory expense, and processing materials. Selling, advertising, administrative, and interest charges were added at $24 per loom.[1] (At $24 a loom it was possible to absorb these charges at 85 per cent of two-shift capacity.)

Profit was also computed on a similar loom basis at $60 per loom. This $60 rate was set so as to return to the blanket division $162,000 profit for the year at three-shift operations. This was considered a "reasonable return" on investment and management. Thus the cost and pricing sheet submitted by the cost department (Exhibit 2) furnished the prices at which the various types of blankets would have to be sold in order to realize the budgeted total profit.

The "Units per Loom" column on Exhibit 2 showed the number of blankets that could be produced on one loom running for forty hours.

The vice-president in charge of government contracts questioned

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[1] As a measure of output, a "loom" meant the number of blankets that could be produced on one loom running for forty hours.

Exhibit 2

MARTALL BLANKET COMPANY

Computations of Costs and Selling Prices for 1941–42

Style	Size (Inches)	Weight (Pounds)	Raw Material ($)	Labor ($)	Expense ($)	Processing Materials ($)	Total Mfg. Cost ($)	Units per Loom	Selling Admin. Interest, Adv.		Total Cost Sold ($)	Profit per Loom ($)	Profit per Blanket ($)	Net Selling Price ($)	Invoice Selling Price ($)	Retail Price 40% ($)
									Per Loom ($)	Per Blanket ($)						
Ashmont......	72 × 90	3.75	4.12	0.93	0.66	0.58	6.29	64	24.00	0.38	6.67	60.00	0.94	7.61	7.76	12.94
Velona........	72 × 90	4.00	4.39	0.94	0.66	0.58	6.57	60	24.00	0.40	6.97	60.00	1.00	7.97	8.13	13.55
Fairfax........	72 × 90	5.00	5.43	1.03	0.74	0.59	7.79	56	24.00	0.43	8.22	60.00	1.07	9.29	9.48	15.80
Army.........	66 × 84	3.75	4.83	0.99	0.63	0.18	6.63	70	24.00	0.34	6.97	60.00	0.86	7.83		
Navy.........	66 × 90	4.25	5.85	1.08	0.64	0.19	7.76	54	24.00	0.44	8.20	60.00	1.11	9.31		

the selling price that the cost department had calculated for Navy blankets. He pointed out that at this price, profit on Navy blankets would be 13.5 per cent of cost, whereas the profit on Army blankets would amount to only 12.3 per cent of cost. Furthermore, the profit margin on Navy blankets was higher, both in absolute terms and as a percentage of cost, than the profit on any of the domestic blankets. The Army contract had already been negotiated at $7.83 per blanket, and the vice-president knew that the Navy would be most reluctant to pay a price that was out of line with the price the Army paid. The company gave the government negotiators full access to all its cost information.

The vice-president realized that the difference in profit margins arose because of the manner in which selling and administrative cost and profit were allocated. He asked the controller either to provide an adequate justification of the price computed in Exhibit 2 or to recalculate the price. The controller replied with a memorandum, which included the following:

> The problem of overhead (used hereafter to include selling, administrative, advertising, and interest charges) and profit distribution is probably the most important source of possible error. While the loom basis of allocation of these items is arbitrary in certain respects and may therefore be misleading, it is certainly not without logical foundation.
>
> The fair basis of allocating profit and overhead apparently depends upon the market conditions existing at the time. If the division can produce all that can be sold, profit and overhead may well be distributed on a per-blanket basis; that is, we could add a certain per cent to each type of blanket for overhead and profit, as you suggested. On the other hand, if total capacity can be sold, the distribution on some measure of capacity, such as loom hours, will provide the fair answer, for such a method takes into account the time required to produce each blanket.
>
> In allocating overhead and profit on a loom basis we have assumed that total blanket division capacity would be completely sold out for the coming fiscal year. For this reason I feel that the blanket prices previously submitted to you are justified.

Questions

1. Assume that Martall was considering the possibility of making Blanket X on which the following information was available (items correspond to column headings in Exhibit 2):

Size	72 × 90 inches	Expense	$0.59
Weight	3.75 lbs.	Processing materials	$0.57
Raw material	$4.38	Total mfg. cost	$6.37
Labor	$0.83	Units per loom	84

Complete the columns in Exhibit 2 for Blanket X, including the retail price necessary to give the desired markup.

2. At what price should Navy blankets be sold?

3. How should the vice-president explain this price in his contract negotiations?

CASE 19–5. UNIVERSITY CAB INCORPORATED

University Cab Incorporated operated eight taxicabs in Cambridge, Massachusetts, a city adjacent to Boston. Although trips were made to any point in the Greater Boston area, most of the company's business originated within a mile radius of Harvard Square, where its cabs were stationed. In 1946 the eight cabs traveled a total of about 400,000 miles.[2] Early in 1947 the owner of the cab company, Mr. Hiram Messier, was considering the installation of two-way radios in his taxicabs, in order to increase telephone call business and to reduce "dead mileage" traveled.

The radio equipment, if purchased, would enable the company's dispatcher to talk directly with the cab drivers and vice versa. A transmitter, receiver, and antenna (land station) would be located at the company's garage on Kirbridge Street, in an office created for that purpose. Each taxicab would be equipped with a radio equipment box, an antenna, a speaker, and a control unit (mobile station). The control unit included a telephone through which the driver could speak to the dispatcher. The range of the equipment was approximately five to ten miles, enough to cover all of Cambridge and a large part of the Boston metropolitan area.

Police departments had used two-way radios for a number of years, but taxicab operators had only recently begun to adopt them. The radios were well developed technically, and there was little danger that improvements would suddenly render existing sets obsolete. Mr. Messier believed that existing sets would become obsolete in ten years but that their physical life was unlimited. If he purchased the radios, however, he intended to depreciate them over a five-year period.

The equipment was operated in the following fashion: If the cab dispatcher desired, for example, to send a cab to Kendall Square, he placed a call to the company's taxicabs. Since the equipment in all the taxis was set on the same frequency, all cabs received the message. The dispatcher requested information on which cabs were near Kendall Square. If a cab was nearby and not occupied, the driver of that cab communicated with the dispatcher and was assigned to the customer. If no cabs were nearby, then a vehicle was sent from the nearest possible place. Conversely, any cab driver could communicate with the dispatcher to ask if business were available. For example, after a driver delivered a passenger to Kendall Square, he could call the dispatcher to see if anyone nearby wanted a cab. If so, he could proceed directly to the designated place without first returning to Harvard Square.

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[2] Before the war Mr. Messier had five cabs that built up a total of about 150,000 miles per year; in 1943 he had seven cabs, and they traveled a total of 490,000 miles.

Under the current method of operation, the dispatcher was located in an office at Harvard Square. When a customer telephoned for a cab, the dispatcher communicated with the drivers through a telephone call box located near the company's taxi stand. The call box was equipped with a loud bell and with lights which could be flashed on to attract the drivers' attention. The dispatcher could not see the call box from his office; consequently, when sufficient pickup business was available, drivers tended to ignore the calls. The Harvard Square office, which was rented for $35 per month, would not be required if radios were purchased; however, $45 rent would be paid for the additional space on Kirbridge Street.

The installation of the radio equipment would involve a substantial investment by University Cab Incorporated. Moreover, the necessary cash would have to be borrowed from the bank. The equipment for each taxicab cost $539, including a $20 installation charge. In addition, each cab would require a special generator which could operate at low engine speeds. This generator cost $60, less a trade-in allowance of $15 on the old generator. The sending and receiving equipment for the land station cost $828, and the antenna $300. If feasible, however, Mr. Messier intended to place the antenna on the roof of a nearby house which he owned, thereby eliminating the need for a mast or tower and reducing the cost of the antenna. The company would have to hire a man to maintain the radios and to be responsible for the proper operation of the land station, at the probable cost of $50 per cab per year. Federal Communications Commission regulations required that a licensed radioman be responsible for the operation of the land station, though his physical presence was not required.

Mr. Messier had been considering the use of two-way radios since the summer of 1945, even though they were not available at that time. By the summer of 1946, the supply of radios was more satisfactory, and several taxicab companies throughout the country had purchased and installed them. The *A-T-A News* and the *Taxicab Industry,* two trade publications, began carrying articles on the success of these radios in taxicab operations. Mr. Messier read the articles carefully, and they impressed him considerably.

The articles indicated that several benefits resulted from the use of two-way radios. One of these benefits was an increase in business coming over the telephone. In January, 1947, telephone business amounted to only 10 per cent of University Cab's total business. With the use of radios, customers could be assured of a prompt response to their request for cabs, often by vehicles cruising in the same neighborhood. Since the dispatcher could communicate directly with the cabs and the drivers could not ignore calls, the uncertainties and delays of the old system were largely eliminated. These uncertainties had created much ill will in the past, particularly during the war when pickup business was sufficient to keep the approximately 100 cabs fully occupied in Cambridge.

Another reported benefit of the use of two-way radios was a decrease in the number of "dead miles" traveled. These dead miles, representing miles traveled without passengers, normally totaled about 50 per cent of the mileage traveled by each cab. By the use of radios, drivers completing a trip could be sent immediately to another customer without the necessity of driving back to the call box. Furthermore, cabs could be dispersed throughout Cambridge instead of being concentrated in one place. Thus calls originating in an outlying area could be handled by a cab based in that area instead of by a cab coming all the way from Harvard Square.

Cutting dead mileage would serve to enlarge the cab company's effective area of operations. Under the current system, long rides were relatively less profitable than short rides originating or ending in Harvard Square, because of the dead mileage involved and because the first mile brought in greater revenue (45 cents) than did subsequent miles (30 cents). Short trips between points distant from the Square were also less desirable than short trips near the Square. With the flexibility made possible by the use of two-way radios, the objections to long trips and to short trips between distant points would largely be eliminated.

The capacity of the cab company's existing equipment would almost certainly be increased by the installation of two-way radios. This increase would result from the elimination of dead mileage and the consequent increase in intensity of cab utilization. Mr. Messier stated that his existing equipment without the installation of radios could handle twice the business being done in January, 1947. He estimated that the use of radios would increase this capacity by an additional 50 per cent.

In January, 1947, University Cab's gross revenue per mile operated was approximately 19 cents. If the two-way radios were successful, Mr.

Messier hoped that the number of dead miles would be reduced substantially. As a consequence of this reduction, he estimated that gross revenue per mile operated would rise to between 23 and 25 cents.

Mr. Messier recognized that the purchase of two-way radios would increase his company's overhead. In fact, Mr. Messier commented that he might have to place more cabs in service in order to increase revenue sufficiently to cover the added costs. He now employed two dispatchers to handle the telephone on a twenty-four-hour basis, but he was not certain that these men would suffice if two-way radio systems were installed. Mr. Messier believed that one man would be kept fully occupied by the radio and that another would be required to handle the telephone and do other necessary work around the office. In addition, the Federal Communications Commission (FCC) required that radio dispatchers be licensed. Neither of the two dispatchers employed by the cab company had these licenses, but the required test was not difficult. The applicant was required to memorize the answers to sixty questions; ten of these questions were asked on the test.

The Federal Communications Commission exercised supervision over the installation and use of two-way radio systems. It had set aside twenty-four frequencies between 152–162 megacycles (mc) for urban mobile radio service. This allocation included two-way communication between land stations and mobile units such as delivery trucks, highway busses, taxicabs, doctors' and nurses' vehicles, oil trucks, river and harbor boats, armored cars, etc. The frequencies were to be assigned in pairs, one for sending and one for receiving, each pair constituting a channel. However, any assignment made by the FCC would be only temporary; no permanent assignments were being made in 1947. In public notice 98700, dated September 30, 1946, the Commission stated that of the first six channels to be assigned, one would be assigned to taxicab systems. The Commission's notice included the following statement: "It should be noted that all applicants proposing to render service of the type specified under notes 1, 2, 3, and 4 would be required to share the channels assignable for that type of service. For example, all taxicab systems will operate their land stations on the common frequency 152.27 Mc."

The use of a single channel by all taxicab companies (152.27 mc for land stations; 157.73 mc for mobile stations) might easily overcrowd the channel, particularly if many companies were using radios in a small area. In January, 1947, only one company in the Boston area was using two-way radios, but it was likely that others would request FCC permission to operate radio systems. Two other cab companies in the state of Massachusetts used radios, one in Brockton and the other in Lowell. The use of a single channel could also lead to abuses; for example, one taxicab company might steal another's calls. Mr. Messier felt that an existing FCC regulation against this practice and the possibility of reprisals were sufficient to deter cab drivers from stealing calls.

The latest reliable figures from the 1940 census showed a population for Cambridge of 110,879. In the same year the population of Boston was 770,816. The population of metropolitan Boston, including areas within a fifteen-mile radius of downtown Boston, was 1,860,461. In 1947 a total of 16 taxicab companies operated in the city of Cambridge and 75 in Boston proper. A total of 353 companies operated in the Boston metropolitan area, including those in Cambridge and Boston proper. However, taxicabs operating in a particular area did not necessarily confine their activities to that area. For example Cambridge taxicabs carried passengers to Boston and vice versa.

In January, 1947, taxicab fares in Cambridge were 45 cents for the first mile and 30 cents for each additional mile. These rates were higher than prewar rates, and there was a real possibility that cuts would be made in the near future. During the war University Cab's daily gross revenue per vehicle was \$20 on the day shift and \$30 on the night shift. In January, 1947, daily revenue had declined to \$12 per cab on the day shift and \$15 per cab on the night shift. The company received 55 per cent of the gross revenue; the driver 45 per cent. Tips were retained by the drivers. Several cab operators, also faced with the problem of declining revenues, believed that a rate cut was the only way to bring gross revenue per cab closer to the wartime level. If a competing company initiated a cut in rates, then University Cab Incorporated would have to follow in order to maintain its competitive position.

Mr. Messier had no elaborate set of books, but he was able to make some costs estimates. He figured depreciation on his cabs at \$500 per year per cab. Rent came to \$125 per month. Gasoline cost 18.4 cents per gallon, and he counted on an average of 11 miles per gallon. Oil was changed every 1,500 miles (15 cents per quart), with 2 quarts per car extra between oil changes. No separate figures on repair and maintenance costs were available. He was "self-insured." In total, he figured his 1946 costs, exclusive of any salary to himself, to be roughly 5 cents per mile.

Question

1. What action do you recommend?

CASE 19–6. EASTERN LOCK COMPANY

In June, 1949, Robert Burns, production engineer of the Eastern Lock Company, asked one of his assistants, John Hawkins, to write a report analyzing the advisability of purchasing some new drilling equipment. Mr. Burns told him that this equipment might be valuable in reducing the cost of manufacturing bases and plungers[3] for certain styles of padlocks. The management of the company was anxious to make cost reductions wherever possible. Mr. Burns told Mr. Hawkins that he expected the report to include specific recommendations supported by a concise but comprehensive analysis. The report would be used as a basis for further study of the proposal by officials responsible for equipment purchases and would serve as the file record of the plan.

Over a period of seventy years the Eastern Lock Company had become known as a large and dependable manufacturer of high-quality locks of several hundred styles. In 1948, sales amounted to over $4 million. Eastern Lock Company was the only lock-making plant in the area. In 1949 it was still operating close to capacity, whereas other metal products concerns in the vicinity were laying off some workers. Business conditions were generally uncertain throughout the country.

The new machinery could be used to make parts for thirteen standard styles of padlocks which the company had been manufacturing for more than forty years. These locks were sold largely to organizations that required the same style of locks throughout all their plants and buildings. The sale of all styles of locks was fairly steady throughout the year; annual sales of the thirteen styles of locks in the postwar period were approximately as follows:

Style A,	3,000 units	Style G,	12,000 units
B,	12,000 "	H,	6,000 "
C,	18,000 "	I,	6,000 "
D,	60,000 "	J,	4,000 "
E,	48,000 "	K,	4,000 "
F,	42,000 "	L,	30,000 "
		M,	12,000 "
		Total	257,000 "

The equipment that Mr. Burns was considering was of two types. One type was semiautomatic equipment for performing the twelve drilling operations required on lock bases. The other type was automatic equipment for drilling lock plungers. In 1949, lock bases and plungers were both drilled on general purpose machines. This method had been used for many years.

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[3] The base (also called the "shell") is the body to which the main working parts of the lock are attached. The base is inserted into the outside case of the lock. The plunger (also called the "bolt") is the small piece which moves against the notch in the shackle and holds it locked.

Drilling Bases

Under the company's existing method, the drilling operations on the bases were performed by semiskilled men who on piece work earned an average of $1.32 per hour for a forty-hour week. Output per man varied somewhat with the particular style of lock base being drilled. On the basis of total annual production figures for the thirteen styles of lock bases, output had averaged thirty-three pieces per worker per hour, exclusive of the setup time. Setup of the machines required very little time and was performed by the operatives, who received no payment for this work.

The semiautomatic machine being considered for the drilling of the lock bases could perform six of the twelve drilling operations at a rate of 225 units per hour; after another setup, the other six drilling operations could then be performed. Or two machines could perform the twelve drilling operations simultaneously, at the rate of 225 completed units per hour; these two machines would easily provide capacity for all thirteen styles. Each machine could be operated by a girl who would be paid about 80 cents an hour. Changing the setup of a machine from the drilling (six holes) of one style of lock base to the drilling of another style would require a skilled mechanic and would take an average of five hours. Skilled mechanics in the Eastern Lock Company received $1.80 an hour. In addition, a charge of 100 per cent of the mechanic's wages was made against setup operations to allow for overhead; this charge was included in the standard overhead for the valuation of inventories and the cost of goods sold.

To operate the machines advantageously, the company would have to produce each style of lock in large lots in order to spread the setup costs over a large number of units. On the other hand, the larger the lot produced, the larger would be the inventory of bases and the longer would be the average time a base remained in inventory. Thus, the inventory-carrying costs per unit would increase. In figuring overhead, Eastern Lock charged 4 per cent per year for capital tied up in inventories and 4 per cent of the value of inventories for space, handling, and so forth. Since the company was operating close to capacity, storage space was limited. It was felt, however, that if some rearranging were done in the stockroom, sufficient space would be available to store the additional inventory. The handling of the additional inventory was expected to require extra labor, and although no close estimate had been made of the cost of this labor, it was believed that perhaps a half (i.e., 2 per cent) of the 4 per cent space and handling charge might represent out-of-pocket costs of handling the inventory.

If large lots were manufactured, the parts would have to be moved into the stockroom, entered on the inventory cards, tagged, and shelved. When these parts were removed from inventory, it would be necessary to record their withdrawal on the inventory cards and then move them out of the stockroom to where they would be needed. Under the company's current method of operation, bases and lock plungers were drilled only as required by the assembly line. They were then moved directly over to the next operation without going through the extra handling and record-keeping procedures of the stockroom.

The company could purchase from the Thompson Machine Company the two identical semiautomatic machines for drilling lock bases at a cost of $8,000 each. A separate set of tools and fixtures would be required for the drilling of each of the thirteen styles of lock bases. The Thompson company would produce sets of tools and fixtures at a cost of $2,500 a set. Thus, to buy complete equipment for drilling the thirteen base styles would require $16,000 for machines and $32,500 for tools and fixtures.

Drilling Plungers

Although the drilling of plungers consisted of only one operation, this operation could not be performed on automatic equipment as long as the present general-purpose machines were used for the twelve drilling operations on the bases. The positions of the holes drilled in the lock bases by general-purpose machines frequently varied slightly, and plungers had to be inserted in lock bases and drilled with general-purpose machines in order that all holes in the finished lock might be in correct alignment. The use of semiautomatic equipment would enable the company to maintain much closer tolerances in the drilling of bases, and plungers could be drilled on automatic equipment prior to their insertion without the danger that the holes in the finished lock would be out of alignment.

If the lock plungers were drilled on automatic machinery, the direct labor cost of this operation could be reduced from the existing figure of $1.00 per 100 plungers to 20 cents per 100. The automatic equipment, which could be quickly set up for the drilling of any type of lock plunger, would cost $11,000. This price included fixtures for drilling all types of plungers used by the company. Drilling was the last one of three machining operations performed on plungers; total labor cost of the three operations was $1.45 per 100.

Other Considerations

Thompson Machine Company was the only concern represented in Eastern Lock's area which sold this type of equipment. Over the years, Eastern Lock had bought considerable equipment from Thompson and had always been satisfied with the quality of the machinery and with Thompson's service.

Eastern Lock was short of cash because of recent expenditures made in connection with the company's cost-reduction program, and for this reason Mr. Hawkins thought that new equipment would have to be financed through bank loans. Mr. Hawkins, on consulting with the company treasurer, felt that Eastern Lock could arrange a bank loan at an interest rate of around 6 per cent.

Thompson listed the expected life of the new drilling equipment as 20,000 to 25,000 hours. Eastern Lock's policy was to depreciate such machinery over fifteen years. Though he had no evidence of a high obsolescence rate on this equipment, Mr. Hawkins knew that the management would expect it to pay for itself in less than the expected usable life. The company expected to earn at least 15 per cent before taxes on its investments.

The five general-purpose machines being used in 1949 to drill bases and plungers were about ten years old. They were originally worth $2,000 each and had a depreciated value in June, 1949, of $675 each. Their scrap value was $50 each. The plant had been largely re-equipped following the war so there was little chance that this equipment could be used elsewhere or that excess time on new equipment could be used. The new equipment would be suitable for only a few other operations in the plant.

Mr. Hawkins realized that the drilling of lock bases with semiautomatic machinery and the drilling of lock plungers with automatic equipment might increase the amount of waste. If a machine were not properly adjusted, a large number of bases of plungers might be drilled before the error was recognized. Under the company's existing method of production, waste had amounted to not more than 1 or 2 per cent of total production cost.

The average manufacturing cost of locks was computed in 1949 to be as follows (for the thirteen styles A–M):

MANUFACTURING COSTS PER 100 UNITS

	Bases*	Plungers*	Others	Complete Locks
Material	$14.30	$0.98	$ 11.42	$ 26.70
Direct labor	4.40	1.45	37.95	43.80
Factory overhead	4.80	1.46	33.14	39.40
Total Factory Cost	$23.50	$3.89	$ 82.51	$109.90
General overhead	9.40	0.86	19.34	29.60
Total Cost	$32.90	$4.75	$101.85	$139.50

* Up to and including the drilling operation only.

Questions

1. What would be the most efficient lot size for the production of base styles A, B, and D using the semiautomatic drilling equipment for bases, and assuming that only one machine is purchased?

Assume that the economic lot sizes of the other base styles are as follows:

Style C, 6,600 units	Style I, 3,800 units
E, 10,700 "	J, 3,100 "
F, 10,000 "	K, 3,100 "
G, Same as B	L, 8,500 "
H, 3,800 units	M, Same as B

2. What action do you recommend?

CASE 19–7. DEEMONT DEPARTMENT STORE

January 31, 1940, marked the end of another fiscal year for the Deemont Department Store, as well as the first real opportunity for checking the performance of the receiving and marking department under a new system installed the previous September. These changes had not involved any radical reorganization of work methods, but they had involved the introduction of a single record form, complete in itself, and also some reduction in personnel. The head of the department, Mr. Willard Burns, had been under pressure to improve the performance of his department, since the store manager believed the store's costs of receiving and marking merchandise were considerably higher than in other comparable stores. Mr. Burns was convinced that the new system would provide a speedier and more accurate check on incoming merchandise, as well as help reduce the cost of operation.

Work of the Receiving and Marking Division

The Deemont Department Store was an old firm which had occupied the same site for over fifty years. Financial reorganization and expansion in 1935 had made it necessary to lease the adjacent building, at least temporarily, and it was on the third and fourth floors of this leased building that the receiving and marking department was housed. Because the new space was leased, alterations had been limited to those absolutely essential to the department's work. Light was fair, much of it coming from electric droplights. Floor space was long, narrow, and irregular in shape. Since the previous tenant had had the fourth floor partitioned into private offices and rooms and no funds had been available for alterations, floor arrangements were particularly poor.

The arrangements of the work space were no more inconvenient than the arrangements for receiving merchandise. Since there was no loading platform, trucks making deliveries had to back up a narrow alley and unload directly into the building's freight elevator. In rush periods this arrangement was very bothersome, and frequently it necessitated leaving merchandise in the alley until space in the elevator was available. The elevator was a small one, measuring approximately 7 feet by 7 feet.

On being checked in at the elevator, the cases and packages of merchandise were sent upstairs to either the third or the fourth floor, the heavier goods for the most part being sent to the fourth floor. China and glassware were sent directly to the stockroom next to the selling floor by way of the freight elevator in the main building; furniture also was delivered and handled outside the receiving and marking department.

When unloaded from the elevator, packages were taken at once by checkers, who opened them and noted their contents. Checkers were expected to count and record the number of items received—pieces, dozens, and so forth. There were three checkers on each of the two floors, and for the most part they specialized in the merchandise they examined. Thus, on the third floor one man was responsible for checking ready-to-wear, women's, misses', and girls' clothing and millinery; the next checker handled umbrellas, hosiery, corsets, jewelry, patterns, intimate apparel, uniforms, house dresses and housecoats, bathrobes, boys' clothing, and infants' wear; and the third man handled gloves, bags, stationery, books, all yard goods, all shoes, men's clothing, and men's furnishings. If a checker had nothing else to do, he was put to work checking other merchandise, but it was thought well to keep a man as familiar as possible with a few types of goods. In rush periods extra help could be obtained through the store manager, and the time of such men was charged to the receiving and marking department.

The checkers placed the counted merchandise on steel tables set on rubber casters. These tables were then taken into the marking room, where stickers or tags with the size, price, and certain coded information on them were affixed to the merchandise. In almost all instances the information was printed on the tags by highly specialized machines available for this work. Some tickets could be printed and pinned or stapled to the merchandise by the same machine.

Certain types of merchandise were not price marked by the store. Any premarked goods bearing the price on the package needed no further marking. Merchandise purchased for a mail-order sale was not marked unless some of it was sent to the selling floor. The receiving and marking department also handled machine markdowns, that is, items for which markdown tickets were affixed by machine. These constituted about one third of all markdowns; the other two thirds were made manually by salespeople. About 20 per cent of all units handled in the store were markdowns. Prior to September, 1939, the receiving and marking department handled all markdowns.

The number of workers in the marking room varied with the flow of merchandise. Receipts were highest in October, November, and December. The October peak coincided with an annual sales event; the high activity in November and December was largely Christmas business. To supplement the regular force of markers, salesgirls who were not busy on the floor could be called in for duty in the marking room. However, in rush periods it was necessary to obtain "contingent" help from the manager's office. No charge was made against the receiving and marking department for help received from the floor, but a charge was made for "contingent" help. Actually, not much help was received from the floor.

The final step in the routing of incoming merchandise was the transporting of the marked goods to the stockrooms or to the selling floor. About 75 per cent of the merchandise was carried away by employees attached to the various selling departments; the rest of the merchandise was transported by employees of the receiving and marking department.

Wages paid the employees in the receiving and marking department were fully as high as elsewhere for comparable work. Receivers were paid approximately $30 per week; checkers, from $22 to $25 per week; markers, from $15 to $18. Markers when on half-time work were paid $10 per week.

Many employees in the receiving and marking department had been with Deemont's a long time. In several instances, employees having long service records, but no longer useful in sales work, had been transferred into the receiving and marking department. To some extent the department was also used as a training ground for new employees, since, in the opinion of the store's executives, there was no better department in which to learn about the store's activities. Exhibit 1 shows a summary of the store record for the employees of the department.

Exhibit 1

DEEMONT DEPARTMENT STORE

Service Record and 1939–40* Payroll of Regular Employees of the Receiving and Marking Department

Division and Name	Date of Entrance to Store (Month and Year)	Date of Entrance to Department (Month and Year)	Annual Payroll 1939–40
Receiving Clerks:			$ 9,930
Bickford, Walter	3-23	3-35	
Barton, James	1-34	12-37	
Jones, Lawrence	10-37	10-37	
Barnes, Kenneth	4-36	10-36	
Morgan, Charles	5-34	12-37	
Checkers:			10,918
Lake, Charles	4-15	12-37	
Atlee, Daniel	10-33	6-37	
Hyde, John	10-34	3-36	
O'Connor, Robert	3-35	4-35	
Smith, John	3-37	3-37	
Leary, Henry	8-37	8-37	
Caffey, William	10-36	10-36	
Markers:			19,994
Storey, Agnes	8-06	3-35	
Sands, Rose	3-09	3-09	
Lansdowne, Olympia	9-24	9-24	
Hanson, Alice	5-27	10-30	
Donahue, Rosemary	4-28	12-34	
Dagby, Ellen	9-31	9-31	
Schneider, Frances	3-35	3-35	
Morse, Irene	8-35	3-38	
Ashby, Sadie	5-09	11-36	
Dolan, Peggy	9-15	3-33	
Meadows, Agnes	9-17	11-36	
Trout, Mary	2-21	3-34	
Brody, Clara	12-22	3-35	
Landy, Annie	3-23	6-36	
Donovan, Mary	5-35	5-35	
Lowney, Catherine	12-12	3-33	
Lowney, Kathleen	3-14	9-33	
Perlew, Minnie	10-15	3-34	
Freedom, Agnes	9-20	9-20	
Torrence, Alice	5-19	2-37	
Frad, Nellie	11-35	11-35	
Supervision:			10,215
Burns, Willard	9-33	3-35	
Anderson, John	8-27	11-32	

* Fiscal year, February, 1939–January, 1940.

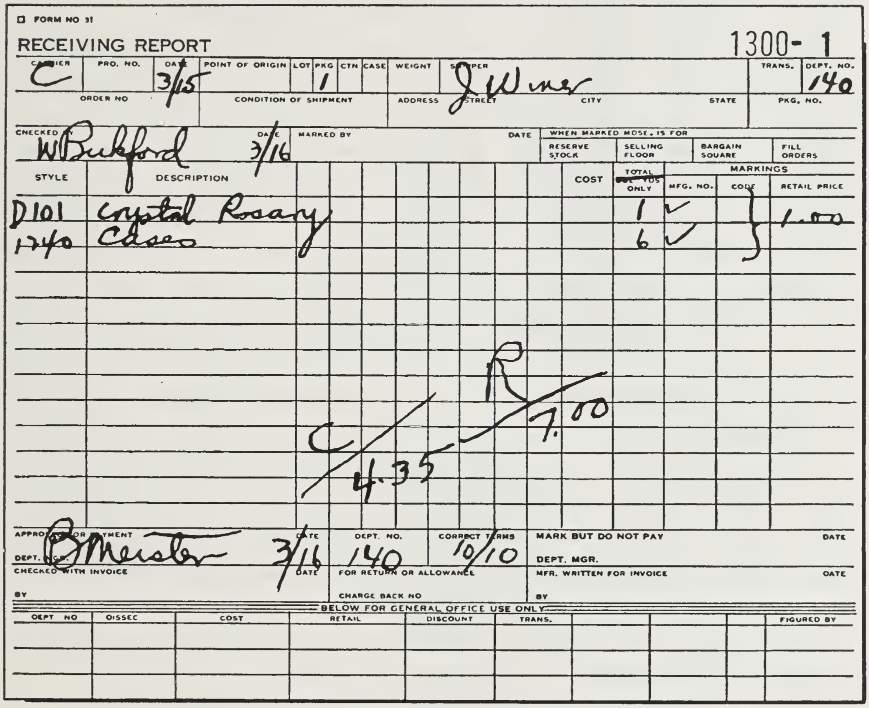
New Control System

The record of merchandise as it went through the receiving and marking stations was vital to the efficient running of the department. Equally important was the development of a control system that would facilitate both speed and accuracy of the work. Such a system, in Mr. Burns' opinion, was that introduced in September, 1939.

Instead of separate report forms for each of various stages of the work, the new plan called for a single report form (reproduced as Exhibit 2). Books of fifty of these forms, numbered serially, were given the receiver at the street entrance to the freight elevator. As merchandise was delivered, the receiver entered on the first two lines of the blank information on kind of transportation, shipper, and condition of shipment (see Exhibit 2). The receiver marked the package with the serial number on the blank, and in instances of two or more packages to the shipment, wrote this number on each package, and also indicated on the report the number of packages that had been received. This marking facilitated the work at the checking stations.

Exhibit 2

DEEMONT DEPARTMENT STORE



☐ FORM NO 31

RECEIVING REPORT 1300- 1

CARRIER C
PRO. NO.
DATE 3/15
POINT OF ORIGIN
LOT
PKG 1
CTN
CASE
WEIGHT
SHIPPER J Winer
TRANS.
DEPT. NO. 140

ORDER NO
CONDITION OF SHIPMENT
ADDRESS STREET CITY STATE
PKG. NO.

CHECKED BY W Bukford DATE 3/16
MARKED BY DATE
WHEN MARKED MDSE. IS FOR: RESERVE STOCK | SELLING FLOOR | BARGAIN SQUARE | FILL ORDERS

STYLE	DESCRIPTION	COST	TOTAL ~~DOZ~~ YDS ONLY	MARKINGS MFG. NO.	MARKINGS CODE	MARKINGS RETAIL PRICE
D101	crystal Rosary		1	✓	}	1.00
1740	Cases		6	✓		

C 4.35
R 7.00

APPROVED FOR PAYMENT DEPT. MGR. B Meister DATE 3/16
DEPT. NO. 140
CORRECT TERMS 10/10
MARK BUT DO NOT PAY DEPT. MGR. DATE
CHECKED WITH INVOICE BY DATE
FOR RETURN OR ALLOWANCE CHARGE BACK NO
MFR. WRITTEN FOR INVOICE BY DATE

BELOW FOR GENERAL OFFICE USE ONLY

DEPT NO	DISSEC	COST	RETAIL	DISCOUNT	TRANS.				FIGURED BY

When the packages were unloaded at the checking stations, the checkers had before them the original and one carbon copy (pink) of the report form. The other carbon copy (yellow) was left in the bound books, which were kept on file in the receiving and marking department as a record of merchandise deliveries. The checkers arranged the report forms in order of serial number and, on inspecting the merchandise, entered on the forms the manufacturer's style number, a description of the goods, and data as to quantity received. (Again see Exhibit 2.) Keeping the reports in serial order assured an orderly flow of received merchandise. Under special circumstances a received order could be moved up with the approval of Mr. Burns or his assistant.

One great advantage of the new system lay in the fact that the check on receipts was a "blind" check. The checker could not know what quantity of goods was supposed to have been delivered unless he found a copy of the invoice included in the shipment, and in such an instance the checker was told to use the enclosed invoice only as a check against his work. The real check came when the report as filled in by the checker was compared with the invoice mailed to the store. The comparison of receiving reports and invoices was the daily responsibility of the store buyers or their assistants. Any discrepancy called for an immediate check on the merchandise in the store. If the overage or shortage was real and not an error made by the checker, the matter was taken up with the shipper.

After examining the receiving reports and the merchandise to which they related, the store buyers signed the reports as approved for payment; if the merchandise had been sent on memorandum, the buyer was careful to sign the form calling for the goods to be price-marked but not calling for payment. If the goods were to be returned to the manufacturer for any reason, directions could be entered in the space provided on the form.

Records of Operations of Receiving and Marking Department

In order to watch the expenses of his department, Mr. Burns had before him a salary budget worked out by him and approved by the store management. This budget was usually a six months' budget and was prepared in detail for each of the sections of the department. Mr. Burns kept a running comparison of his actual payroll expenses with the budget and with the previous year's payroll. Exhibit 3 gives the budget and actual payroll for the department as a whole for the three six-month periods from August, 1938, through January, 1940.

The chief item of cost in the receiving and marking department was

Exhibit 3

DEEMONT DEPARTMENT STORE

Comparison of Budgeted and Actual Expenses*
Receiving and Marking Department

Month	1938–39		1939–40	
	Budget	Actual	Budget	Actual
February			$ 4,349	$ 4,218
March			4,935	5,066
April			4,643	4,929
May			4,930	5,398
June			4,727	5,203
July			4,697	4,588
Six-Month Total			$28,281	$29,402
August	$ 4,458	$ 4,515	$ 5,027	$ 4,998
September	4,412	5,034	4,971	5,403
October	5,157	5,424	5,606	5,866
November	5,072	5,759	5,566	5,827
December	5,108	6,100	5,531	5,459
January	4,287	4,712	4,970	4,845
Six-Month Total	$28,494	$31,544	$31,671	$32,398

* Includes supplies and expense of personnel dealing with customer returns.

labor cost. Records of such costs were carefully maintained. From these records, Mr. Burns prepared the analysis shown in Exhibit 4. To him, the figures showed that the new plan was a success.

Until the introduction of the new report form, Mr. Burns had kept daily records of the production flow through his division. Each day a clerk would transcribe from the appropriate report forms then in use

Exhibit 4

DEEMONT DEPARTMENT STORE

Mr. Burns' Analysis of Results from New System

	Prior to New System			Under New System		
	Feb.–Aug., 1938	Feb.–Aug., 1939	% Change	Sept.–Jan., 1938–39	Sept.–Jan., 1939–40	% Change
Number of people employed	44.5	42.8	−3.8	47.8	45.4	−5.0
Cost of labor	$26,016	$28,898	+11.1	$22,080	$22,108	0.0
Cost of labor as percentage of sales	0.57	0.64	+12.3	0.43	0.42	−2.3
Cost of labor as percentage of purchases	0.77	0.87	+14.3	0.64	0.63	−1.6

the number of items handled in the division. During the last twelve months for which the figures were collected, production varied from a peak of 1,048,000 pieces marked in October, 1938, to lows of 445,000 in August, 1938, and 446,000 in February, 1939. (The monthly figures available since September, 1935, are shown in Exhibit 5.) Although production figures provided a good basis for judging the flow of work

Exhibit 5

DEEMONT DEPARTMENT STORE

Data Relating to the Operation of the Receiving and Marking Department September, 1935–January, 1940

Year and Month	Units Handled (Thousands)	Average Number Employees	Payroll	Payroll as Percentage of Store Sales	Percentage Change over Sales of Previous Year Same Month
1935:					
September	829	45.9	$3,228	0.39	....
October	671	61.6	4,258	0.34	....
November	1,063	54.4	4,046	0.50	....
December	1,229	54.6	3,680	0.30	....
1936:					
January	618	45.1	3,355	0.53	....
February	431	44.2	2,992	0.52	....
March	735	43.3	3,109	0.43	....
April	844	47.0	3,450	0.37	....
May	645	46.5	3,413	0.47	....
June	718	46.1	3,367	0.41	....
July	396	44.3	3,361	0.70	....
August	506	45.0	3,196	0.51	....
September	873	48.2	3,715	0.38	....
October	1,063	59.6	4,329	0.32	....
November	1,049	56.3	3,918	0.44	....
December	1,218	55.9	4,864	0.38	....
1937:					
January	835	46.7	3,437	0.47	....
February	550	46.7	3,106	0.51	....
March	679	48.2	3,642	0.47	10.9
April	762	48.6	3,665	0.41	0.2
May	665	47.1	3,679	0.50	5.2
June	648	47.2	3,672	0.48	−2.3
July	566	47.2	3,613	0.79	1.5
August	446	45.1	3,549	0.67	−10.9
September	746	48.7	3,762	0.38	0.1
October	982	52.9	4,275	0.34	−4.6
November	761	53.8	4,137	0.48	−3.1
December	862	51.0	4,407	0.36	−4.4
1938:					
January	677	47.8	3,940	0.59	−8.3
February	493	45.4	3,527	0.61	−2.7
March	637	45.6	3,917	0.55	−6.4
April	778	44.5	3,606	0.38	6.6
May	610	44.7	3,782	0.59	10.9

Exhibit 5—Continued

Year and Month	Units Handled (Thousands)	Average Number Employees	Payroll	Payroll as Percentage of Store Sales	Percentage Change over Sales of Previous Year Same Month
June	612	43.9	$ 3,653	0.50	−3.3
July	525	43.6	3,686	0.93	−13.1
August	445	43.7	3,845	0.70	5.0
September	669	45.3	4,010	0.42	−1.2
October	1,048	48.7	4,298	0.37	−7.0
November	768	53.0	4,778	0.54	3.8
December	1,005	52.9	5,016	0.40	1.9
1939:					
January	704	42.7	3,978	0.64	−6.6
February	446	41.7	3,629	0.67	−7.3
March	597	42.8	4,257	0.62	−3.6
April	746	44.3	4,100	0.46	−6.9
May	690	45.3	4,424	0.60	13.2
June	622	44.6	4,293	0.59	−1.6
July	....	41.8	3,966	0.99	1.5
August	....	39.1	4,229	0.77	−0.3
September	....	46.5	4,395	0.47	−3.0
October	....	45.1	4,702	0.38	6.4
November	....	51.1	4,818	0.52	2.9
December	....	43.5	4,248	0.33	1.4
1940:					
January	....	40.2	3,946	0.60	4.6

in the receiving and marking rooms, collection of these figures was stopped because, in Mr. Burns' opinion, they were not useful enough to justify the one or two hours a day of a clerk's time which their compilation required.

The number of employees was another measure of activity in the department, since extra workers were employed only at rush times. Likewise, store sales provided a measure of output, though primarily for the store as a whole, since sales lagged somewhat behind activity in the receiving and marking department. Comparison of receiving and marking department wages with sales was a useful means of judging performance. The tabulation of this expense ratio by months, September, 1935–January, 1940 (Exhibit 5), shows wide variation. Exhibit 6 shows a chart of payroll expenses and average number of employees.

Store executives had access each month to data on labor costs of similar departments in other stores. In Exhibit 7, comparative payroll data are presented for the ten stores co-operating in furnishing cost records. The figures relate to the six-month period ending January 31, 1940, and to the twelve-month period also ending January 31, 1940.

The store which executives believed to be most comparable with the Deemont store was that designated as "K." Annual sales, by departments and unit sales (i.e., sales per sales check), for both the Deemont Department Store and Store "K" are given in Exhibit 8.

Exhibit 6

NUMBER OF EMPLOYEES AND PAYROLL

Receiving and Marking Department
Deemont Department Store and Store "K"

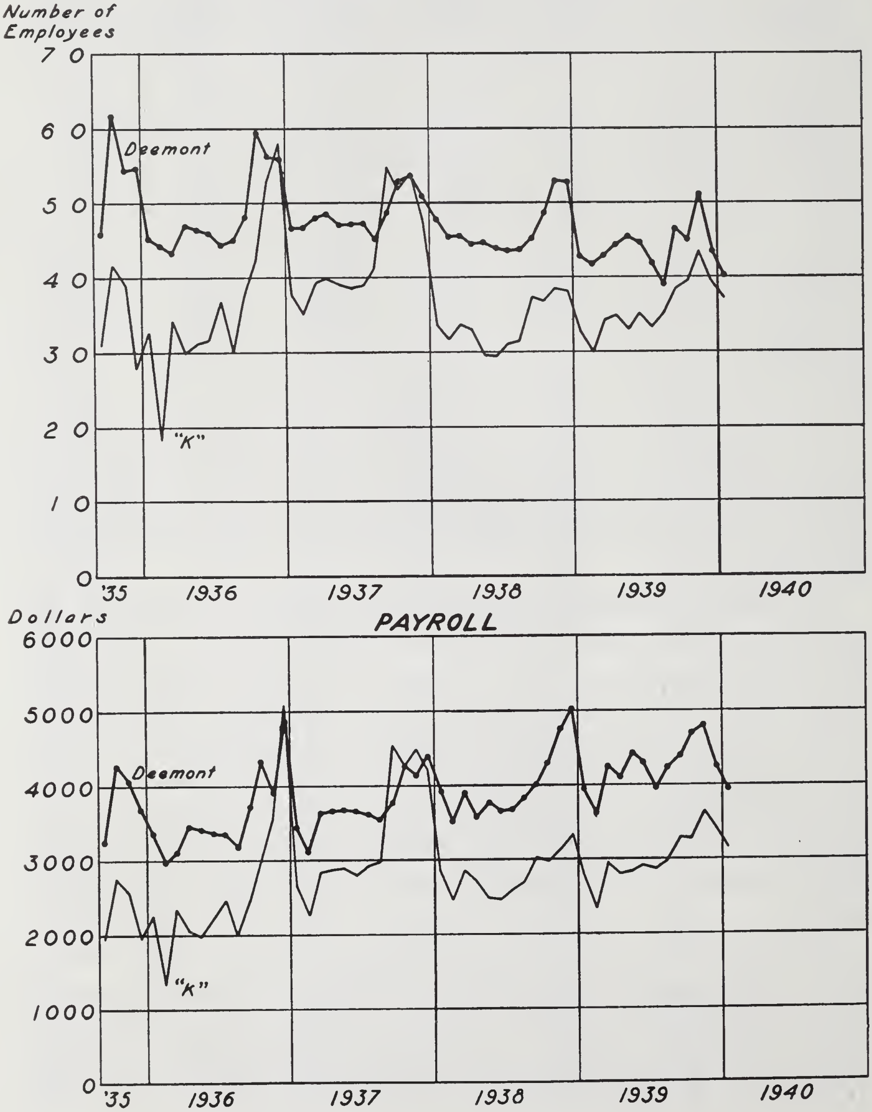


Exhibit 7

COMPARATIVE PAYROLL DATA, RECEIVING AND MARKING DEPARTMENTS

Ten Co-operating Department Stores

Store and Period	Average Number of Employees, Period Ending Jan. 31,		Total Payroll, Period Ending Jan. 31,		Payroll as % of Sales, Period Ending Jan. 31,	
	1940	1939	1940	1939	1940	1939
Last 6 Months of Year:						
Deemont	44.3	47.8	$26,338	$25,925	0.47%	0.48%
K	38.8	35.8	19,776	17,913	0.33	0.33
A	40.5	39.2	21,992	19,415	0.30	0.30
B	42.9	39.3	21,046	19,456	0.35	0.34
D	32.1	29.8	18,505	17,600	0.35	0.33
E	63.1	57.9	27,498	24,996	0.47	0.46
F	44.0	42.2	24,826	23,931	0.59	0.58
G	...	...	....	....	...	...
H	35.0	27.9	16,139	13,236	0.43	0.40
I	31.1	32.2	14,129	14,577	0.44	0.49
Full Year:						
Deemont	43.8	46.2	51,007	48,096	0.53	0.51
K	36.1	33.6	36,544	33,501	0.35	0.35
A	38.2	37.9	38,923	36,465	0.30	0.31
B	37.8	35.3	37,619	35,715	0.36	0.36
D	30.7	29.6	35,536	34,595	0.37	0.36
E	53.9	49.6	48,334	44,145	0.48	0.47
F	39.7	37.3	44,630	42,705	0.61	0.60
G	...	...	....	....	...	...
H	30.6	26.7	28,354	25,273	0.43	0.44
I	32.0	30.4	28,784	27,230	0.49	0.50

Exhibit 8

NET SALES AND UNIT SALES, DEEMONT DEPARTMENT STORE AND STORE "K"

Twelve Months Ending January, 1940

Section	Net Sales		Unit Sales	
	Deemont Department Store (Thousands)	Store "K" (Thousands)	Deemont Department Store	Store "K"
Piece goods	$ 675	$ 681	$2.03	$1.70
Small wares	1,544	1,416	1.31	1.18
Women's ready-to-wear	2,244	2,792	4.49	4.67
Men's wear	838	993	3.48	3.64
Home furnishings	2,447	1,990	7.49	6.56
Basement	1,526	1,974	2.09	1.82

The ranking of the several stores depended on many influences difficult to measure. However, the changing position of the Deemont store in the group, with reference to receiving and marking labor cost as a percentage of store sales, is clearly indicated by the figures in Exhibit 9. Rank No. 1 was given to store with lowest percentage cost.

Exhibit 9

COMPARISON OF PAYROLL EXPENSE RATIOS OF RECEIVING AND MARKING DEPARTMENTS

Deemont Department Store, Store "K," and Co-operating Group

Date	Payroll Expense Ratio*		Rank for Deemont Department Store among All Stores†
	Deemont Department Store	Store "K"	
1935:			
September	0.39	0.51	6
October	0.34	0.43	2
November	0.50	0.47	6
December	0.30	0.21	7
1936:			
January	0.53	0.51	8
February	0.52	0.31	8
March	0.43	0.46	7
April	0.37	0.37	4
May	0.47	0.35	8
June	0.41	0.42	5
July	0.70	0.49	8
August	0.51	0.37	6
September	0.38	0.45	4
October	0.32	0.37	2
November	0.44	0.55	5
December	0.38	0.42	7
1937:			
January	0.47	0.71	4
February	0.51	0.43	8
March	0.47	0.37	9
April	0.41	0.44	5
May	0.50	0.42	8
June	0.48	0.43	8
July	0.79	0.48	9
August	0.67	0.51	9
September	0.38	0.54	4
October	0.34	0.57	2
November	0.48	0.54	4
December	0.36	0.30	8
1938:			
January	0.59	0.43	7
February	0.61	0.42	8
March	0.55	0.38	9
April	0.38	0.35	5
May	0.59	0.37	10
June	0.50	0.36	9
July	0.93	0.41	10
August	0.70	0.41	10
September	0.42	0.40	5
October	0.37	0.36	3
November	0.54	0.35	7
December	0.40	0.22	9
1939:			
January	0.64	0.39	7
February	0.67	0.41	9
March	0.62	0.38	9
April	0.46	0.36	7
May	0.60	0.35	10
June	0.59	0.39	10
July	0.99	0.41	10
August	0.77	0.41	10
September	0.47	0.37	8
October	0.38	0.36	4
November	0.52	0.35	9
December	0.33	0.20	7
1940:			
January	0.60	0.40	7

* Percentage of sales.

† Nine stores prior to January 1, 1938; ten stores thereafter. Rank No. 1 represents the lowest expense ratio.

Questions

1. Should Mr. Burns have been satisfied with the performance of his department? How much of the responsibility was his?

2. If you were asked, as an outsider, to draw such conclusions as you could from the record, what would you say?

3. If you were asked to probe the matter further, what would you do? What additional information would you request?

CASE 19–8. R. S. MOLLOY COMPANY, INC.

In August, 1953, Mr. William R. Brown, engineering vice-president and plant manager of the R. S. Molloy Company, Inc., was asked by Mr. Stanley E. Vernon, the company's president, to make a recommendation as to whether the company should purchase a new printing press, and if so, which of two printing presses under consideration should be purchased.

During the three years ended December 31, 1952, the company's pressroom operation had shown a loss totaling $48,223 (see Exhibit 1). Mr. Vernon believed that this loss was caused by the use of old, obsolete presses which produced at slower speeds and required more down time for maintenance and repairs than the newer types of presses used by some of the Molloy Company's competitors. According to Mr. Brown, the company's own engineering department had investigated the problem and had concluded that the basic construction of the present presses was such that further improvements could not be made on them.

Mr. Vernon stated that the company had been forced to refuse orders and limit sales volume because of the limited capacity of the present presses. These presses had been operating at peak capacity for the last two years, except for down time for repairs and maintenance. Because it was necessary to run the printing department to provide work for the bindery department, where profits more than compensated for printing department losses (see Exhibit 1), the company had continued to do printing work at a loss.

Recent Developments in Printing Presses

Since 1939, when reconditioned, high-speed rotary magazine presses had been purchased by the company for paper-bound book production, important advances and improvements had taken place in the paper-bound book printing business. In 1946, the Stein Company, an ink manufacturer with a printing machinery subsidiary, had engineered and

Exhibit 1

R. S. MOLLOY COMPANY, INC.

Departmental Operating Statement—Years Ending December 31

	Total for Year			Pressroom			Bindery		
	1950	1951	1952	1950	1951	1952	1950	1951	1952
Sales	$416,560	$509,940	$746,904	$115,322	$127,031	$223,417	$293,264	$382,909	$523,487
Material used	$ 49,153	$ 61,217	$101,151	$ 7,934	$ 6,907	$ 14,315	$ 33,246	$ 54,310	$ 86,836
Productive labor	174,836	220,223	343,964	76,240	80,777	149,296	98,596	139,446	194,668
Outside work	1,500	13,072	10,478	5	8,366	7,527	1,495	4,705	2,950
Factory overhead*	82,692	109,365	156,332	29,983	31,712	39,493	52,708	77,652	116,839
Depreciation	30,000	30,000	30,000	5,333	5,333	5,333	24,667	24,667	24,667
Cost of sales	$338,181	$433,877	$641,925	$119,495	$133,095	$215,964	$210,712	$300,780	$425,960
Manufacturing profit (or loss)	$ 78,379	$ 76,063	$104,979	$ (4,173)	$ (6,064)	$ 7,453	$ 82,552	$ 82,129	$ 97,527
Administrative expense	$ 39,515	$ 35,353	$ 42,685	$ 10,988	$ 8,806	$ 12,767	$ 27,948	$ 26,546	$ 29,918
Selling expense	9,593	13,602	19,992	2,707	3,388	5,980	6,886	10,214	14,013
Discounts allowed	704	1,102	1,106	198	274	331	505	827	775
Total Admin. Selling and Discount	$ 49,812	$ 50,057	$ 63,783	$ 13,893	$ 12,468	$ 19,078	$ 35,339	$ 37,587	$ 44,706
Operating profit (or loss)	$ 28,567	$ 26,006	$ 41,196	($ 18,066)	($ 18,532)	($ 11,625)	$ 47,213	$ 44,542	$ 52,821
Other Income:									
Sales of waste	$ 13,411	$ 15,949	$ 47,441						
Miscellaneous income	507	404	1,343						
Total	$ 13,918	$ 16,353	$ 48,784						
Net profit before taxes	$ 42,485	$ 42,359	$ 89,980						
Federal income tax	2,147	1,745	55,700						
Net Profit after Tax	$ 40,338	$ 40,614	$ 34,280						

( ) Denotes red figures.

* Includes nonproductive labor, social security taxes, shipping supplies, electricity, steam, compensation insurance, freight and cartage, and state excise taxes.

constructed a new high-speed press especially designed for paper-bound edition printing and had sold this press to one of the Molloy Company's competitors. Next, in 1947, the Dougal Company Limited, an English printing machinery company, produced an even higher speed press for paper-bound book printing that produced 7,000, 128-page impressions[4] per hour. The Dougal Company thereafter continued to improve its presses. According to Mr. Vernon, recent technological changes in printing presses, which were still continuing, made presses obsolete long before they were worn out. Ordinarily, presses had a physical life of from fifty to seventy-five years, but Mr. Vernon estimated that, because of continual improvement and design changes, the useful life of a new press was not in excess of fifteen or twenty years. The Molloy presses were approximately ten years old when they had been bought by the company in 1939.

Investigation of New Presses

As a result of his study of technological developments in printing presses for paper-bound books, Mr. Vernon concluded, in November, 1951, that the only way the company could compete with the lower cost producers would be to buy a new, improved press. He then asked Mr. Brown to begin a detailed search for the best possible press the company could buy.

Mr. Brown contacted several printing press manufacturers, but of these the Dougal Company seemed to be the only feasible source. Other firms which manufactured presses of the type under consideration had such a large backlog of orders that they would be unable to engineer and produce the type of press needed for several years.

The sales manager of the Dougal Company assured Mr. Brown, by letter from the company's head office in London, England, that Dougal could produce one of its newest, high-speed rotary type presses, engineered especially for paper-bound book printing, and have it set up in the company's plant ready for production in eight to ten months from the date of the order. The Dougal sales manager estimated that this press would sell for $160,000 complete, set up in the Molloy plant, including shipping costs. The press had been introduced early in 1953 and had a capacity of 10,000 to 12,000, 128-page impressions per hour.

The Dougal Company maintained a limited inventory of parts in its New York service center, but Mr. Brown thought there was still a possibility of a serious delay for servicing and parts in the event of a breakdown. He had learned from conversations with other printers that foreign press equipment was not serviced with the same speed and interest that American press equipment was serviced.

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[4] One "impression" was a large sheet printed on both sides with 128 pocketbook edition sized pages; that is, there were 64 pages on each side, or 128 pages in total, in one impression.

Shortly after he received the letter from Dougal, Mr. Brown was contacted by the sales manager of the Fennel Printing Machinery Company of Baltimore. The sales manager arranged for a Fennel engineer to make a preliminary study of Molloy's problem. Following this study, Fennel's president wrote that his company could engineer and manufacture a press specifically for Molloy that would produce 10,000 to 12,000, 256-page impressions per hour. Fennel quoted a firm price of $210,000 for the press, installed and ready to run in the Molloy plant, including engineering, production, shipping, and construction costs.

Mr. Vernon knew that the Fennel Company also manufactured folding and slitting equipment that was used with nearly all the large rotary press installations in the country. It had built numerous special types of presses and had engineered and perfected many new attachments and improvements for presses. According to the Fennel Company's production manager, the press could be set up and ready to produce by eighteen or twenty months after the date of the order.

A penalty clause, providing for reduction in cost if deadlines were not met, could be written into either the Dougal or Fennel contracts.

Production

The production of paper-bound books involved considerably less work and time than hard-cover volumes because the page sizes were standardized; for this reason, fewer changes were required on the presses for each new edition printed. In 1953, the Molloy Company had three presses, which produced sheets of 192, 160, and 128 pocket-book sized pages per impression, respectively.[5] Each press was scheduled so that its total capacity was used, in so far as possible, at all times. In normal operation, each of the presses produced at the average actual rate of 4,500 impressions per hour when it was in full operation, but because of down time for maintenance, repairs, and plate changes, and periods when the presses could not run at full speed due to mechanical difficulties, actual production per day was about 52 per cent of this theoretical capacity. In 1953, production averaged 140,000, 192-page books per day.[6]

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[5] The production process consisted of printing the pages on the presses, then cutting and collating the pages, and finally binding and trimming the books in the bindery department. Each separate page on a 192-, 160-, or 128-page impression would be different, so that the printing job for the total number of pages in any one book was usually handled on two presses.

Mr. Brown estimated that after accounting for down time for all causes, a new press would average 80 per cent of its theoretical capacity. He converted these estimates of theoretical and actual capacity for each of the three presses now used and for the Dougal and Fennel press to a common base, as shown in Exhibit 2.

If the company bought a new press, Mr. Brown thought that the old presses should be retained with the expectation that additional volume could be obtained to keep them busy, although the oldest—the 128-page per impression press—might be kept primarily for stand-by capacity.

Exhibit 2

R. S. MOLLOY COMPANY, INC.

Actual Capacity of Presses in Terms of Number of 192-Page Books* per Eight-Hour Shift

Press	Theoretical Capacity	Estimated Efficiency	Estimated Actual Capacity
Present No. 192	36,000	52%	18,600
Present No. 160	30,000	52	16,600
Present No. 128	24,000	52	12,500
Dougal	59,000	80	47,200
Fennel	117,000	80	93,600

* The 192-page book is used in the trade only as a measure of production. Seldom, if ever, would a paper-bound edition book be exactly 192 pages in length.

The company owned two of the latest type binding machines and had recently spent $250,000 on bindery department equipment, which increased the capacity of the bindery from 75,000 to 150,000 books per shift. Some of the older bindery department equipment was set aside as stand-by equipment which would not be used until volume reached capacity. The press department worked twenty-four hours per day, and the bindery worked sixteen hours per day. The plant worked a five-day week. Lack of skilled press operators and strong union opposition prevented the company from working more than a five-day week.

Cost

The "hour cost," consisting of direct labor and plant overhead, was currently $11.30 per hour on each of the present presses. This figure was arrived at by taking the total cost of labor and factory overhead charged to the pressroom in a period and dividing by the number of direct labor hours worked in that period. Production costs per impression were approximately the same on any of the three present presses. The accountant estimated that factory overhead costs would be increased by about $500 per annum for the Fennel press, because of additional steam, heat, and similar items, but that no significant amount of additional factory costs would be incurred if the Dougal press were used. The hourly wage rate (exclusive of taxes and fringe benefits) of the four men necessary to run any one of the present or proposed presses totaled $8.75. Each press crew consisted of one master pressman, paid $3.40 per hour, and three semiskilled workmen. When the amount of printing to be done did not warrant the operation of all presses, the master pressman from the nonoperating press could join the crew of an operating press, and surplus semiskilled crewmen could be given other employment in the plant on either a temporary or permanent basis.

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[6] The "192-page book" is a term used in the trade as a measure of production.

The overhead included in the "hour cost" was only plant overhead, which included the cost of servicing the press, baling, transportation of paper, and other miscellaneous charges incurred in operating the presses. For pricing purposes a general overhead figure of 56.1 per cent of the hour cost was taken to cover such general overhead items as depreciation on plant and equipment, light, power, taxes, insurance, sales, administrative, and general expenses. Although all general overhead costs were considered by the accountant to be nearly fixed regardless of volume, the company was planning to leave the percentage figure at 56.1 per cent on the work produced on a new press, if one was purchased, and permit the actual unit difference to show up as an additional profit. Depreciation currently allowed on new printing and binding machinery was 6⅔ per cent per year, but Mr. Vernon expected to be granted permission to depreciate a new press at a 10 per cent rate because of its unusual obsolescence factor.

The bindery department in the Molloy Company had consistently shown a profit (see Exhibit 1). Mr. Brown stated that the present bindery production volume could easily be doubled with only a negligible increase in present overhead because of the added capacity available on the new semiautomatic bindery equipment. Mr. Brown also stated that, as far as he knew, other costs in the plant would not be affected by the addition of a new press.

The company's federal income tax liability had been reduced in 1950 and 1951 by a carry-forward of abnormal losses from 1946 and 1947. For 1953, Mr. Vernon expected the company's income to be taxed at a 52 per cent rate.

Balance sheet information is shown in Exhibit 3.

Exhibit 3

R. S. MOLLOY COMPANY, INC.

Balance Sheets—December 31, 1951 and December 31, 1952

ASSETS

	Dec. 31, 1951	*Dec. 31, 1952*
Cash in banks	$ 23,524	$ 53,972
U.S. government securities	46,224	127,800
Accounts receivable, gross	$ 79,240	$ 87,368
Less: Reserve for bad debts	4,624	4,979
Net Accounts Receivable	$ 74,616	$ 82,389
Inventory:		
Pressroom	$ 3,820	$ 4,242
Bindery	30,468	35,101
Total Current Assets	$ 178,652	$ 303,504
Capital Assets:		
Real estate, plant and equipment	$1,397,856	$1,397,856
Less: Accumulated depreciation and obsolescence	306,424	339,817
Net Capital Assets	$1,091,432	$1,058,639
Deferred charges	$ 385	$ 327
Total Assets	$1,270,469	$1,362,470

LIABILITIES AND CAPITAL

	Dec. 31, 1951	*Dec. 31, 1952*
Accounts payable, trade	$ 12,496	$ 14,681
Accrued salesmen's commissions	2,943	4,486
Accrued taxes:		
New York excise tax	$ 5,800	$ 6,400
Social security taxes	3,897	4,099
Federal income tax	2,592	55,783
Total Taxes	$ 12,289	$ 66,282
Total Current Liabilities	$ 27,728	$ 85,449
Capital stock	900,000	990,000
Earned surplus	342,741	287,021
Total Liabilities and Capital	$1,270,469	$1,362,470

Marketing

Paper-bound books first became an important factor in the publishing business around 1830, when inventions and improvements in the printing trade made possible the issuance of cheap reprints of popular editions. Since that time the paper-bound book business exhibited considerable over-all growth despite several minor setbacks. Although paper-bound books had been popular as far back as the 1870's, from 1900 to the late 1930's their production was a negligible factor in the publishing industry. In the late 1930's, the development of superior technical processes and new merchandising techniques touched off a revival of the paper-bound book business. During World War II, sales rose to about 130,000,000 paper-bound books annually. Estimates of sales figures for the total paper-bound book industry for recent years were as follows:[7]

Year	*Number of Books Sold*
1951	230,000,000
1952	250,000,000
1953	275,000,000

Because of increasing population and maintained per capita buying power, Mr. Vernon thought the figure for 1954 would increase to about 300,000,000. If buying slacked off and demand fell, Mr. Vernon believed that a competitive pricing situation would probably develop.

The company's nine salesmen sold the paper-bound book printing and binding services to the publishers of paper-bound editions who did not have the facilities for printing paper-bound books themselves. Sales contracts generally ran from three to five years, and a schedule of issues was set up for each publisher for about one year in advance, thus allowing the Molloy Company to schedule work well in advance of actual production. Prices on these contracts could be changed if there were material changes in costs.

Total sales figures for the Molloy Company were as follows:

Year	*Dollar Volume*
1944	$697,000
1945	703,000
1946	200,000
1947	335,000
1948	380,000
1949	387,000
1950	417,000
1951	510,000
1952	747,000

Since 1945, when Molloy had lost its one big customer to a competitor, the company attempted to diversify its customer list. In 1953 Molloy served on a regular basis nine of the approximately fourteen paper-bound book publishers then in business. Most publishers had, in recent years, adopted the policy of spreading their work among several printers in order to achieve added flexibility and assurance of sources of supply.

Mr. Vernon believed that sales volume could be doubled in the next two years if the production capacity were available. The extra business would come, he thought, from increased sales to old customers, from new customers, and from an increase in the variety of work the company could take for either the Dougal or Fennel presses. Either of these presses could handle pamphlets, staple-bound booklets, and other printing jobs that the present presses could not accommodate. This diversification was part of the company's total program to obtain "insurance" against a slump in any one part of the business. The extra volume, Mr. Vernon believed, would be obtained as a result of extra effort and push on the part of the sales force, which at present had slackened its efforts because capacity had already been reached. New business was anticipated also on the basis of inquiries which the company was receiving from time to time. For example, in a recent two-week period two new customers, who were going into the paper-bound book field, had come to Molloy because they had heard of its reputation for producing good quality books. Mr. Vernon said that, at the time, the company's press capacity permitted it to sign a contract with only one of these prospective customers.

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[7] Freeman Lewis, *Paper-Bound Books in America* (New York: New York Public Library, 1953).

The selling price for printing done on the company's present presses was \$4.83 per thousand 128-page impressions for the first hundred thousand impressions and \$4.20 for each additional thousand if run at the same time. Binding was billed separately. Mr. Brown estimated that 50 per cent of the Molloy's printing production was billed at \$4.83 per thousand and the other 50 per cent at \$4.20. The company's terms were 2/10, n/30. These prices were in line with those charged by other paper-bound edition printers. The cost of paper was not included in these prices since paper was supplied by the publisher.

Mr. Vernon believed that the company could obtain the same price for production on either of the new presses and that there was no need to undercut competitors' prices because additional paper-bound edition printing work was, in his opinion, easy to obtain. Mr. Vernon stated that it would be a "good ace to have up our sleeve to have the cost advantage of a new press, if selling should get tough." Competing printers would not cut prices unless they were forced to, Mr. Vernon thought.

The Molloy Company's binding department did work for outside printers amounting to approximately \$60,000 in 1952.

Company History

Although legally it was an entirely separate company, the R. S. Molloy Company was established and managed by the executives controlling the Homestead Publishing Company, Inc. The Homestead Company was founded in 1907, and until 1938 it produced only hard-bound books sold through traditional bookstore channels. In 1939, the

Homestead Company entered the paper-bound pocket-size book business. Because this business was in a state of uncertainty in 1939, the Homestead Company did not invest in new equipment, but produced the paper-bound books on secondhand, reconditioned magazine presses which were modified for book work.

In 1942 paper-bound book sales volume had increased to $120,000, and this increase led to problems in administration, sales, accounting, and production. Consequently, the executives of the Homestead Publishing Company separated the paper-bound book business into a new company, named the R. S. Molloy Company, Inc. Shortly thereafter, the Molloy Company purchased from Homestead the machinery used for paper-bound books. The Molloy operations were located in a building, which it owned, adjoining the Homestead plant in Newburgh, New York.

Mr. Vernon had sharp memories of 1931 because of the heavy losses the Homestead Company sustained in that year. The older members of management all remembered vividly that practically no one in Newburgh was working at that time. Company officials felt a real responsibility to build a business that would give a regular income to its employees and get away from the peaks and valleys of the business cycle. Because of social security and other unemployment compensation, Mr. Vernon believed that no matter what the economic climate, there would be a market for low-cost paper-bound books. "This," said Mr. Vernon, "is the thinking behind our concentration in paper-bound editions."

Questions

1. If you were in Mr. Brown's position, what action would you recommend to Mr. Vernon?

TABLE A

Present Value of $1

Years Hence	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1.......	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714	0.690	0.667
2.......	0.980	0.961	0.925	0.890	0.857	0.826	0.797	0.769	0.756	0.743	0.718	0.694	0.672	0.650	0.640	0.630	0.610	0.592	0.549	0.510	0.476	0.444
3.......	0.971	0.942	0.889	0.840	0.794	0.751	0.712	0.675	0.658	0.641	0.609	0.579	0.551	0.524	0.512	0.500	0.477	0.455	0.406	0.364	0.328	0.296
4.......	0.961	0.924	0.855	0.792	0.735	0.683	0.636	0.592	0.572	0.552	0.516	0.482	0.451	0.423	0.410	0.397	0.373	0.350	0.301	0.260	0.226	0.198
5.......	0.951	0.906	0.822	0.747	0.681	0.621	0.567	0.519	0.497	0.476	0.437	0.402	0.370	0.341	0.328	0.315	0.291	0.269	0.223	0.186	0.156	0.132
6.......	0.942	0.888	0.790	0.705	0.630	0.564	0.507	0.456	0.432	0.410	0.370	0.335	0.303	0.275	0.262	0.250	0.227	0.207	0.165	0.133	0.108	0.088
7.......	0.933	0.871	0.760	0.665	0.583	0.513	0.452	0.400	0.376	0.354	0.314	0.279	0.249	0.222	0.210	0.198	0.178	0.159	0.122	0.095	0.074	0.059
8.......	0.923	0.853	0.731	0.627	0.540	0.467	0.404	0.351	0.327	0.305	0.266	0.233	0.204	0.179	0.168	0.157	0.139	0.123	0.091	0.068	0.051	0.039
9.......	0.914	0.837	0.703	0.592	0.500	0.424	0.361	0.308	0.284	0.263	0.225	0.194	0.167	0.144	0.134	0.125	0.108	0.094	0.067	0.048	0.035	0.026
10.......	0.905	0.820	0.676	0.558	0.463	0.386	0.322	0.270	0.247	0.227	0.191	0.162	0.137	0.116	0.107	0.099	0.085	0.073	0.050	0.035	0.024	0.017
11.......	0.896	0.804	0.650	0.527	0.429	0.350	0.287	0.237	0.215	0.195	0.162	0.135	0.112	0.094	0.086	0.079	0.066	0.056	0.037	0.025	0.017	0.012
12.......	0.887	0.788	0.625	0.497	0.397	0.319	0.257	0.208	0.187	0.168	0.137	0.112	0.092	0.076	0.069	0.062	0.052	0.043	0.027	0.018	0.012	0.008
13.......	0.879	0.773	0.601	0.469	0.368	0.290	0.229	0.182	0.163	0.145	0.116	0.093	0.075	0.061	0.055	0.050	0.040	0.033	0.020	0.013	0.008	0.005
14.......	0.870	0.758	0.577	0.442	0.340	0.263	0.205	0.160	0.141	0.125	0.099	0.078	0.062	0.049	0.044	0.039	0.032	0.025	0.015	0.009	0.006	0.003
15.......	0.861	0.743	0.555	0.417	0.315	0.239	0.183	0.140	0.123	0.108	0.084	0.065	0.051	0.040	0.035	0.031	0.025	0.020	0.011	0.006	0.004	0.002
16.......	0.853	0.728	0.534	0.394	0.292	0.218	0.163	0.123	0.107	0.093	0.071	0.054	0.042	0.032	0.028	0.025	0.019	0.015	0.008	0.005	0.003	0.002
17.......	0.844	0.714	0.513	0.371	0.270	0.198	0.146	0.108	0.093	0.080	0.060	0.045	0.034	0.026	0.023	0.020	0.015	0.012	0.006	0.003	0.002	0.001
18.......	0.836	0.700	0.494	0.350	0.250	0.180	0.130	0.095	0.081	0.069	0.051	0.038	0.028	0.021	0.018	0.016	0.012	0.009	0.005	0.002	0.001	0.001
19.......	0.828	0.686	0.475	0.331	0.232	0.164	0.116	0.083	0.070	0.060	0.043	0.031	0.023	0.017	0.014	0.012	0.009	0.007	0.003	0.002	0.001	
20.......	0.820	0.673	0.456	0.312	0.215	0.149	0.104	0.073	0.061	0.051	0.037	0.026	0.019	0.014	0.012	0.010	0.007	0.005	0.002	0.001	0.001	
21.......	0.811	0.660	0.439	0.294	0.199	0.135	0.093	0.064	0.053	0.044	0.031	0.022	0.015	0.011	0.009	0.008	0.006	0.004	0.002	0.001		
22.......	0.803	0.647	0.422	0.278	0.184	0.123	0.083	0.056	0.046	0.038	0.026	0.018	0.013	0.009	0.007	0.006	0.004	0.003	0.001	0.001		
23.......	0.795	0.634	0.406	0.262	0.170	0.112	0.074	0.049	0.040	0.033	0.022	0.015	0.010	0.007	0.006	0.005	0.003	0.002	0.001			
24.......	0.788	0.622	0.390	0.247	0.158	0.102	0.066	0.043	0.035	0.028	0.019	0.013	0.008	0.006	0.005	0.004	0.003	0.002	0.001			
25.......	0.780	0.610	0.375	0.233	0.146	0.092	0.059	0.038	0.030	0.024	0.016	0.010	0.007	0.005	0.004	0.003	0.002	0.001	0.001			
26.......	0.772	0.598	0.361	0.220	0.135	0.084	0.053	0.033	0.026	0.021	0.014	0.009	0.006	0.004	0.003	0.002	0.002	0.001				
27.......	0.764	0.586	0.347	0.207	0.125	0.076	0.047	0.029	0.023	0.018	0.011	0.007	0.005	0.003	0.002	0.002	0.001	0.001				
28.......	0.757	0.574	0.333	0.196	0.116	0.069	0.042	0.026	0.020	0.016	0.010	0.006	0.004	0.002	0.002	0.002	0.001	0.001				
29.......	0.749	0.563	0.321	0.185	0.107	0.063	0.037	0.022	0.017	0.014	0.008	0.005	0.003	0.002	0.002	0.001	0.001	0.001				
30.......	0.742	0.552	0.308	0.174	0.099	0.057	0.033	0.020	0.015	0.012	0.007	0.004	0.003	0.002	0.001	0.001	0.001					
40.......	0.672	0.453	0.208	0.097	0.046	0.022	0.011	0.005	0.004	0.003	0.001	0.001										
50.......	0.608	0.372	0.141	0.054	0.021	0.009	0.003	0.001	0.001	0.001												

TABLE B

Present Value of $1 Received Annually for *N* Years

Years (*N*)	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1	0.990	0.980	0.962	0.943	0.926	0.909	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714	0.690	0.667
2	1.970	1.942	1.886	1.833	1.783	1.736	1.690	1.647	1.626	1.605	1.566	1.528	1.492	1.457	1.440	1.424	1.392	1.361	1.289	1.224	1.165	1.111
3	2.941	2.884	2.775	2.673	2.577	2.487	2.402	2.322	2.283	2.246	2.174	2.106	2.042	1.981	1.952	1.923	1.868	1.816	1.696	1.589	1.493	1.407
4	3.902	3.808	3.630	3.465	3.312	3.170	3.037	2.914	2.855	2.798	2.690	2.589	2.494	2.404	2.362	2.320	2.241	2.166	1.997	1.849	1.720	1.605
5	4.853	4.713	4.452	4.212	3.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991	2.864	2.745	2.689	2.635	2.532	2.436	2.220	2.035	1.876	1.737
6	5.795	5.601	5.242	4.917	4.623	4.355	4.111	3.889	3.784	3.685	3.498	3.326	3.167	3.020	2.951	2.885	2.759	2.643	2.385	2.168	1.983	1.824
7	6.728	6.472	6.002	5.582	5.206	4.868	4.564	4.288	4.160	4.039	3.812	3.605	3.416	3.242	3.161	3.083	2.937	2.802	2.508	2.263	2.057	1.883
8	7.652	7.325	6.733	6.210	5.747	5.335	4.968	4.639	4.487	4.344	4.078	3.837	3.619	3.421	3.329	3.241	3.076	2.925	2.598	2.331	2.108	1.922
9	8.566	8.162	7.435	6.802	6.247	5.759	5.328	4.946	4.772	4.607	4.303	4.031	3.786	3.566	3.463	3.366	3.184	3.019	2.665	2.379	2.144	1.948
10	9.471	8.983	8.111	7.360	6.710	6.145	5.650	5.216	5.019	4.833	4.494	4.192	3.923	3.682	3.571	3.465	3.269	3.092	2.715	2.414	2.168	1.965
11	10.368	9.787	8.760	7.887	7.139	6.495	5.988	5.453	5.234	5.029	4.656	4.327	4.035	3.776	3.656	3.544	3.335	3.147	2.752	2.438	2.185	1.977
12	11.255	10.575	9.385	8.384	7.536	6.814	6.194	5.660	5.421	5.197	4.793	4.439	4.127	3.851	3.725	3.606	3.387	3.190	2.779	2.456	2.196	1.985
13	12.134	11.343	9.986	8.853	7.904	7.103	6.424	5.842	5.583	5.342	4.910	4.533	4.203	3.912	3.780	3.656	3.427	3.223	2.799	2.468	2.204	1.990
14	13.004	12.106	10.563	9.295	8.244	7.367	6.628	6.002	5.724	5.468	5.008	4.611	4.265	3.962	3.824	3.695	3.459	3.249	2.814	2.477	2.210	1.993
15	13.865	12.849	11.118	9.712	8.559	7.606	6.811	6.142	5.847	5.575	5.092	4.675	4.315	4.001	3.859	3.726	3.483	3.268	2.825	2.484	2.214	1.995
16	14.718	13.578	11.652	10.106	8.851	7.824	6.974	6.265	5.954	5.669	5.162	4.730	4.357	4.033	3.887	3.751	3.503	3.283	2.834	2.489	2.216	1.997
17	15.562	14.292	12.166	10.477	9.122	8.022	7.120	6.373	6.047	5.749	5.222	4.775	4.391	4.059	3.910	3.771	3.518	3.295	2.840	2.492	2.218	1.998
18	16.398	14.992	12.659	10.828	9.372	8.201	7.250	6.467	6.128	5.818	5.273	4.812	4.419	4.080	3.928	3.786	3.529	3.304	2.844	2.494	2.219	1.999
19	17.226	15.678	13.134	11.158	9.604	8.365	7.366	6.550	6.198	5.877	5.316	4.844	4.442	4.097	3.942	3.799	3.539	3.311	2.848	2.496	2.220	1.999
20	18.046	16.351	13.590	11.470	9.818	8.514	7.469	6.623	6.259	5.929	5.353	4.870	4.460	4.110	3.954	3.808	3.546	3.316	2.850	2.497	2.221	1.999
21	18.857	17.011	14.029	11.764	10.017	8.649	7.562	6.687	6.312	5.973	5.384	4.891	4.476	4.121	3.963	3.816	3.551	3.320	2.852	2.498	2.221	2.000
22	19.660	17.658	14.451	12.042	10.201	8.772	7.645	6.743	6.359	6.011	5.410	4.909	4.488	4.130	3.970	3.822	3.556	3.323	2.853	2.498	2.222	2.000
23	20.456	18.292	14.857	12.303	10.371	8.883	7.718	6.792	6.399	6.044	5.432	4.925	4.499	4.137	3.976	3.827	3.559	3.325	2.854	2.499	2.222	2.000
24	21.243	18.914	15.247	12.550	10.529	8.985	7.784	6.835	6.434	6.073	5.451	4.937	4.507	4.143	3.981	3.831	3.562	3.327	2.855	2.499	2.222	2.000
25	22.023	19.523	15.622	12.783	10.675	9.077	7.843	6.873	6.464	6.097	5.467	4.948	4.514	4.147	3.985	3.834	3.564	3.329	2.856	2.499	2.222	2.000
26	22.795	20.121	15.983	13.003	10.810	9.161	7.896	6.906	6.491	6.118	5.480	4.956	4.520	4.151	3.988	3.837	3.566	3.330	2.856	2.500	2.222	2.000
27	23.560	20.707	16.330	13.211	10.935	9.237	7.943	6.935	6.514	6.136	5.492	4.964	4.524	4.154	3.990	3.839	3.567	3.331	2.856	2.500	2.222	2.000
28	24.316	21.281	16.663	13.406	11.051	9.307	7.984	6.961	6.534	6.152	5.502	4.970	4.528	4.157	3.992	3.840	3.568	3.331	2.857	2.500	2.222	2.000
29	25.066	21.844	16.984	13.591	11.158	9.370	8.022	6.983	6.551	6.166	5.510	4.975	4.531	4.159	3.994	3.841	3.569	3.332	2.857	2.500	2.222	2.000
30	25.808	22.396	17.292	13.765	11.258	9.427	8.055	7.003	6.566	6.177	5.517	4.979	4.534	4.160	3.995	3.842	3.569	3.332	2.857	2.500	2.222	2.000
40	32.835	27.355	19.793	15.046	11.925	9.779	8.244	7.105	6.642	6.234	5.548	4.997	4.544	4.166	3.999	3.846	3.571	3.333	2.857	2.500	2.222	2.000
50	39.196	31.424	21.482	15.762	12.234	9.915	8.304	7.133	6.661	6.246	5.554	4.999	4.545	4.167	4.000	3.846	3.571	3.333	2.857	2.500	2.222	2.000

TABLE C

Present Value of $1/12 Received Monthly for *N* Years

Years (*N*)	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1	0.995	0.989	0.979	0.969	0.959	0.950	0.941	0.932	0.928	0.924	0.915	0.907	0.899	0.892	0.888	0.884	0.877	0.870	0.853	0.837	0.822	0.808
2	1.979	1.959	1.920	1.883	1.848	1.814	1.781	1.750	1.735	1.720	1.691	1.663	1.637	1.611	1.598	1.586	1.562	1.539	1.485	1.435	1.390	1.347
3	2.954	2.910	2.826	2.746	2.670	2.599	2.531	2.467	2.436	2.406	2.348	2.293	2.241	2.191	2.167	2.143	2.098	2.054	1.953	1.863	1.781	1.706
4	3.920	3.843	3.696	3.559	3.432	3.313	3.201	3.096	3.046	2.998	2.905	2.818	2.736	2.658	2.621	2.585	2.516	2.450	2.300	2.168	2.050	1.946
5	4.876	4.757	4.533	4.327	4.137	3.962	3.799	3.648	3.577	3.508	3.377	3.256	3.142	3.036	2.985	2.936	2.842	2.755	2.557	2.386	2.236	2.106
6	5.822	5.653	5.338	5.051	4.790	4.551	4.333	4.132	4.038	3.948	3.778	3.620	3.475	3.340	3.276	3.214	3.098	2.989	2.747	2.541	2.365	2.212
7	6.759	6.531	6.111	5.734	5.395	5.088	4.810	4.557	4.439	4.327	4.117	3.924	3.748	3.585	3.509	3.435	3.297	3.169	2.888	2.653	2.453	2.283
8	7.687	7.392	6.855	6.379	5.954	5.575	5.235	4.929	4.788	4.654	4.404	4.177	3.971	3.783	3.695	3.611	3.453	3.308	2.992	2.732	2.514	2.330
9	8.605	8.237	7.571	6.987	6.473	6.018	5.615	5.256	5.091	4.935	4.647	4.388	4.154	3.942	3.844	3.750	3.575	3.414	3.070	2.789	2.556	2.362
10	9.515	9.065	8.259	7.560	6.953	6.421	5.955	5.543	5.355	5.178	4.854	4.564	4.305	4.071	3.963	3.860	3.670	3.497	3.127	2.829	2.585	2.383
11	10.415	9.876	8.920	8.101	7.397	6.788	6.258	5.794	5.584	5.388	5.029	4.711	4.428	4.175	4.058	3.948	3.744	3.560	3.169	2.858	2.605	2.397
12	11.307	10.672	9.556	8.612	7.809	7.121	6.528	6.015	5.784	5.568	5.177	4.833	4.529	4.259	4.135	4.018	3.802	3.608	3.201	2.879	2.619	2.406
13	12.189	11.452	10.167	9.094	8.190	7.423	6.770	6.208	5.957	5.724	5.302	4.935	4.611	4.326	4.196	4.073	3.847	3.646	3.224	2.894	2.629	2.412
14	13.063	12.217	10.755	9.548	8.542	7.699	6.985	6.378	6.108	5.858	5.409	5.019	4.679	4.380	4.245	4.117	3.883	3.674	3.241	2.904	2.635	2.417
15	13.928	12.967	11.321	9.977	8.869	7.949	7.178	6.527	6.239	5.973	5.499	5.090	4.735	4.424	4.284	4.152	3.911	3.696	3.254	2.912	2.640	2.419
16	14.785	13.702	11.864	10.381	9.171	8.176	7.350	6.658	6.353	6.073	5.576	5.149	4.780	4.460	4.315	4.179	3.932	3.713	3.264	2.917	2.643	2.421
17	15.633	14.422	12.387	10.762	9.451	8.383	7.503	6.772	6.452	6.159	5.640	5.198	4.818	4.488	4.340	4.201	3.949	3.726	3.271	2.921	2.645	2.422
18	16.473	15.129	12.890	11.122	9.711	8.571	7.640	6.873	6.539	6.233	5.695	5.239	4.848	4.511	4.360	4.218	3.962	3.736	3.276	2.924	2.647	2.423
19	17.305	15.822	13.373	11.462	9.951	8.742	7.763	6.961	6.614	6.297	5.742	5.273	4.873	4.530	4.376	4.232	3.973	3.744	3.280	2.926	2.648	2.424
20	18.128	16.501	13.838	11.782	10.173	8.897	7.872	7.038	6.679	6.352	5.781	5.301	4.894	4.545	4.389	4.243	3.981	3.750	3.283	2.927	2.648	2.424
21	18.943	17.167	14.285	12.084	10.379	9.038	7.969	7.106	6.735	6.399	5.815	5.325	4.911	4.557	4.399	4.252	3.987	3.755	3.285	2.928	2.649	2.424
22	19.750	17.819	14.714	12.369	10.570	9.167	8.056	7.165	6.785	6.440	5.843	5.345	4.925	4.567	4.407	4.259	3.992	3.758	3.286	2.929	2.649	2.425
23	20.549	18.459	15.127	12.638	10.746	9.283	8.134	7.218	6.828	6.476	5.867	5.361	4.936	4.574	4.414	4.264	3.996	3.761	3.287	2.929	2.649	2.425
24	21.341	19.087	15.525	12.892	10.909	9.389	8.204	7.263	6.865	6.506	5.887	5.375	4.945	4.581	4.419	4.269	3.999	3.763	3.288	2.930	2.650	2.425
25	22.124	19.702	15.906	13.131	11.061	9.486	8.266	7.304	6.897	6.532	5.904	5.386	4.953	4.586	4.423	4.272	4.001	3.765	3.289	2.930	2.650	2.425
26	22.899	20.305	16.274	13.357	11.201	9.574	8.321	7.339	6.926	6.555	5.919	5.396	4.959	4.590	4.426	4.275	4.003	3.766	3.289	2.930	2.650	2.425
27	23.667	20.896	16.627	13.570	11.331	9.653	8.370	7.370	6.950	6.574	5.931	5.404	4.964	4.593	4.429	4.277	4.004	3.767	3.290	2.930	2.650	2.425
28	24.428	21.476	16.966	13.771	11.451	9.726	8.415	7.397	6.971	6.591	5.942	5.410	4.968	4.596	4.431	4.279	4.005	3.768	3.290	2.930	2.650	2.425
29	25.180	22.044	17.293	13.961	11.562	9.792	8.454	7.421	6.990	6.606	5.951	5.416	4.972	4.598	4.433	4.280	4.006	3.768	3.290	2.930	2.650	2.425
30	25.926	22.601	17.607	14.139	11.665	9.852	8.489	7.441	7.006	6.618	5.958	5.420	4.975	4.600	4.434	4.281	4.007	3.769	3.290	2.930	2.650	2.425
40	32.985	27.605	20.153	15.456	12.356	10.220	8.688	7.550	7.087	6.678	5.992	5.440	4.986	4.606	4.439	4.285	4.009	3.770	3.291	2.931	2.650	2.425
50	39.375	31.711	21.873	16.191	12.676	10.361	8.752	7.580	7.107	6.692	5.999	5.443	4.987	4.607	4.440	4.285	4.009	3.770	3.291	2.931	2.650	2.425

Note: It is assumed that monthly increments earn simple interest until the end of each year and that entire amount is discounted annually.

Formula: $\dfrac{1-(1+i)^{-n}}{12[(1+i)^{1/12}-1]}$

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